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SYLLABUS
OF
PERSONAL HYGIENE

EUGENE C. HOWE

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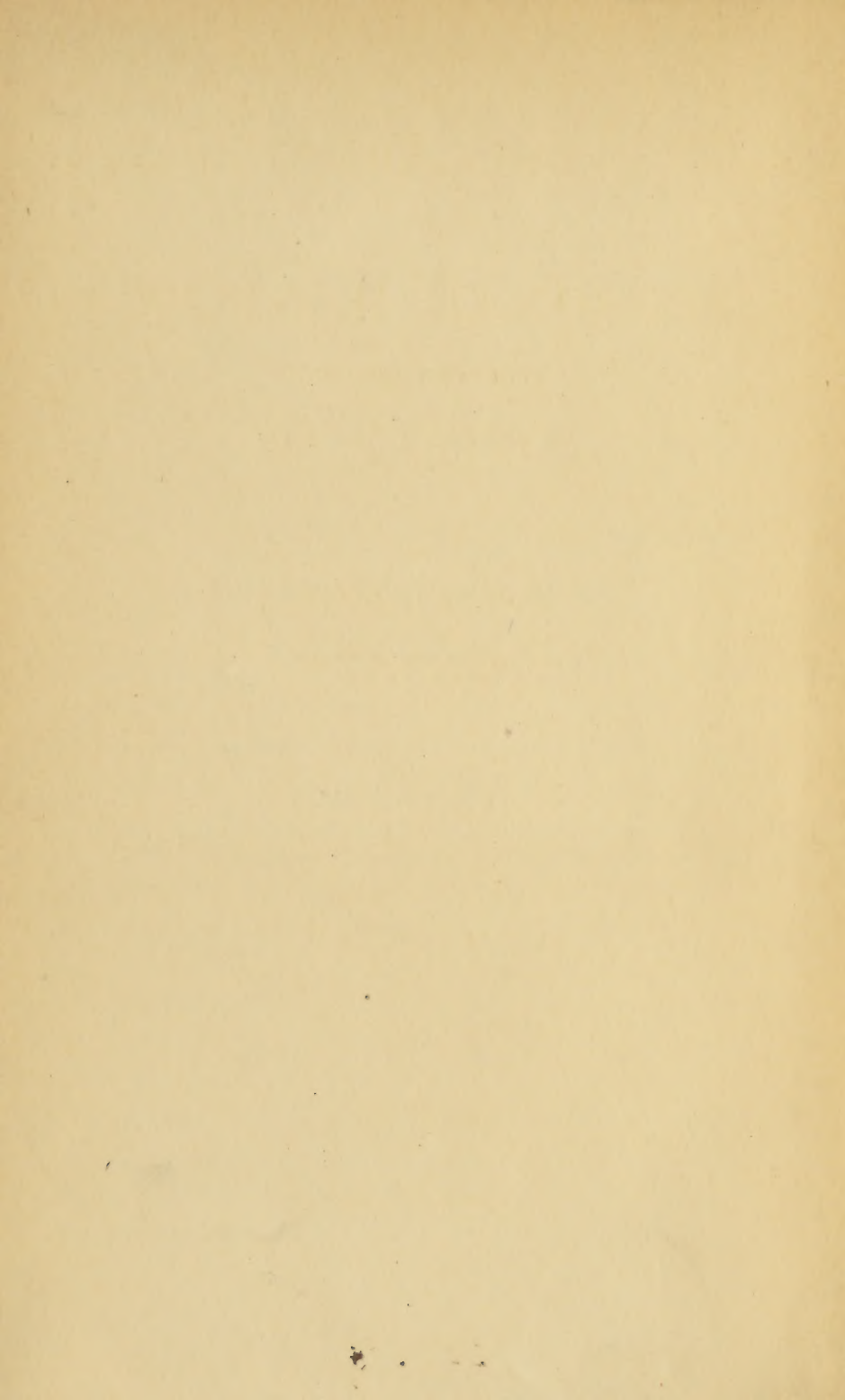
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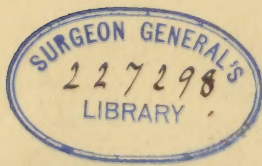
SYLLABUS
OF
PERSONAL HYGIENE
FOR COLLEGES

BY
EUGENE C. HOWE

ASSOCIATE PROFESSOR OF HYGIENE
WELLESLEY COLLEGE

E Boston, The Ranger company, 1916

THIRD REVISION



QT

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CONTENTS.

Foreword	5
General Outline and Lecture Headings	9
Lecture Outlines	17
References	202

FOREWORD.

There are many who really believe that better health can be maintained when little or no attention is given to the care of the body, except for the avoidance of glaring abuse and the observance of common decency. They doubt the practicability or the profit of studying the workings of the human body and of endeavoring, consciously, to control and regulate its activities. Others have a hazy, egotistical notion that their powers of recuperation are a bit better than the common run, or that, should physical vigor prematurely ebb, "Nature" and the doctor may always be depended upon to reinstate it. Still others advise that one should ignore the existence of his physical self. Finally, there are the very many who give the matter no thought at all; to whom the idea of a correlation between health and long-lived usefulness almost never occurs.

What is the sane attitude toward the problem of successful maintenance of sound vitality, and what are its scientific basis and justification in simplest terms?

If you were presented with a camera, or a phonograph, or a bread-mixer, or a vacuum-cleaner, and told to learn how to make it "go," you would set about the task with a feeling that you had a fair chance of success. You would readily see that, left to itself, it remains motionless and useless; that by study and manipulation it can be made to "go," to "work," to do the thing it is intended to do. It would also be obvious that it can be mishandled and broken or quickly worn out; and that it can be repaired and made as good as new.

Now the human body is so closely associated with one's personality that it may seem well-nigh impossible to look upon it as a machine. For obvious reasons you have never known it to be stopped—completely motionless, like an unwound phonograph. It has always been going, and nearly always talking. It seems to need no more direction or propulsion than that afforded by the casual, frictionless guidance of the will. It slows down and drags more or less, to be sure, when one is

tired or ill, but a little rest or medical treatment sets it going again, apparently as good as ever.

But it is a fact that essentially one's body is similar in operation to a bread-mixer or phonograph. Only by means of the energy given the latter by winding the spring, will the phonograph respond. It may be too tightly or too loosely wound, well or ill oiled and cleaned, its records well or ill cared for, and upon these things depends the quality of its response. Similarly, one's body must be wound up—must receive the energy of one's daily rations. It may or may not receive its energy supply in the correct form and amount, it may or may not be properly guided to dispose correctly of depressing wastes, and upon these things, among others, depend the quality and amount of its usefulness—its serviceableness.

Like all useful ideas, this of comparing the non-living to the living mechanism is true only in part. For, after all, the living body is different from a mere machine. A man is more than a phonograph.

Precisely wherein is the comparison not a true one? First, after accident or abuse, repair can probably never make the living machine as good as it was before. Second, in the greater part of its internal working, it is for all practical purposes self-sufficient and self-operating. More than this, it will not tolerate attempted interference. A non-living machine may be tinkered in every detail of its mechanism to its advantage, but the operations of the living body should best, in large measure, be allowed to take care of themselves without attention of any sort. Self analysis and inspection—mental tinkering—are likely to prevent rather than enhance both physical and mental health.

The subject of personal hygiene deals, then, with these difficult questions—what are the true conditions for strong vitality, which of them can profitably be studied and which should best be treated with studied disregard?

But one must not imagine that the science of personal hygiene pretends to define all the conditions for healthful living for every individual. Certain generalizations based on

experiment, concerning exercise, rest, sleep, diet, etc., are applicable, almost without exception, in a fairly homogeneous group. Beyond, but in the light of these generalizations, everyone must construct his own system of conduct, which in his case serves best to maintain physical stamina. But one must be on guard here against a common failing even among those who should know better—in fact among specialists in the subjects of personal hygiene and physiology—namely against allowing personal bias, strong desires or habits to cause him, in his practice of personal hygiene, to mistake a contradiction of general principle for one of his special needs.

Neither should the science of personal hygiene, in its exposition before an educated audience, be expected to go at great length into the gross rules of body care—rules which should be dictated primarily by the sense of decency and fitness. Nor should it consist in mere statements and enumerations of “rules of health” without primary emphasis on the advantages and values of health and physical education, and without adequate scientific explanation. Finally it should be understood that personal hygiene is scientific health preparedness, and that it must not intrude into the province of medicine.

In the following lectures, the statements of the “problem” and the “concluding comments” at the beginning and end of each lecture are not intended to be complete and self-explanatory, but to serve as introductory keys and concluding reminders. They should be read in an actively enquiring spirit, bare statements inspected, probed, and challenged in the light of lecture notes and assigned reading.

GENERAL OUTLINE
AND
LECTURE HEADINGS.

GENERAL OUTLINE AND LECTURE HEADINGS.

In the left hand margin are given the lecture headings corresponding to the topics of the outline.

Introduction.

Lecture 1.
Introduction.

1. Health. Its usefulness.
2. The health problems of college life.
3. The body as a living mechanism.
4. Preaching and practice.

I. Personal Hygiene.

Lecture 2.
Muscular
Exercise.

- A. Directed activities of the body and their conditions.

1. Muscle-nerve activity.

Exercise.

The mechanism of physical work.

Action and successful living.

Lecture 3.
Muscular
Exercise, cont.

The far-reaching effects of use or disuse.

The muscles themselves.

Other organs.

Exercise, in relation to clothing, sleep, meals, bathing, sex.

Lecture 4.
Posture.

Danger of overdoing.

Posture.

Advantages of good posture.

The need for special attention.

Lecture 5.
Posture, cont.

Practical standards of good posture.

Postural defects.

Means of attaining and maintaining good posture.

Lecture 6.
Thought, Mood,
and Habit.

2. Nerve activity.

Interrelation with muscular activity.

Study.

Work and worry.

Emotional training.

Lecture 7.
Fatigue.

3. Fatigue.

The sensation and the condition.
Its causes, prevention, and cure.
Fatigue and external temperature; and diet.
Characteristics of the tired nervous system.
Nervousness. Neurasthenia.

Lecture 8.
Rest,
Vacations.

4. Rest.

Types of rest.
Advantage of periodic recuperation.
Rest vs. idleness.
Practical programs.
Sleep.

Lecture 9.
Use and Care
of the Eye.

5. Use of the sense organs.

Eye.
Structure and operation.
Structural defects.
Results of uncorrected structural defects.
Means of correction.
Use of the eye and symptoms of abuse.
External affections.
Ear. (Nose and throat.)

Lecture 10.
Ear, Nose and
Throat.

B. Food.

Lecture 11.
Food
Requirements—
Qualitative.

1. Requirements, diet, etc.

Physiologic requirements.

a. Qualitative.

Lecture 12.
Minor Con-
stituents and
Accessory Ar-
ticles of Diet.

Classification of foodstuffs.
Their uses.
Accessory articles of diet—pros and cons.

Lecture 13.
Vegetarianism
and Meat Eating.

Vegetarianism.
Meat eating.

Lecture 14.
Food
Requirements —
Quantitative.

b. Quantitative.

Amount of fuel and repairing material needed.

The Calorie.

Energy values of the foodstuffs.

Balance sheet of the body.

The lower limit of energy transformation.

The latter's variation under different conditions.

Lecture 15.
Should the Diet
be Barely or
Ample
Sufficient?

Claims for bare or ample sufficiency in diet.

Central position of protein in the argument.

Dietary insurgents — ancient and modern.

Results claimed by both sides.

Lecture 16.
Dietaries.

Dietaries.

During growth.

For mental work.

For muscular work.

To increase weight.

Obesity. Climate. Clothing. Age.
Size. Sex.

Dietaries in student life.

Lecture 17.
Preparation.
Cost. Menus.
Adulteration.

Preparation. Cost. Menus. Adulteration.

Preserving of food.

Cooking.

Calorie vs. weight standard.

Rock bottom of cost and the usual increments.

Sample menus.

Lecture 18.
Digestion.

2. Digestion.

General consideration of the mechanism and operation of the digestive tract.

Care of the teeth.

Hygiene of mastication.

Fletcherism and its opponents.

Lecture 19.
The Care of the
Teeth.
The Hygiene of
Mastication.

Influence of diet on digestion.

Digestibility and absorbability.

Digestibility and absorbability of the various foods and foodstuffs.

Water drinking and digestion.

Alcohol.

Indigestion. Its causes.

Individual peculiarities. Dangerous combinations. (?)

Lecture 20.
Digestion.
Influence
of Diet.

Lecture 21.
Autointoxication.

Autointoxication.

Intestinal autointoxication.

Intestinal residue.

Types of decomposition.

Bacteria of the tract.

Poisonous substances they may form.

Their possible effects.

Prevention of intestinal autointoxication.

Diet. Digestion. Bowel movement.

Bacteria.

Fermented milks.

Lecture 22.
Factors in
Digestion other
than Diet.

Factors in digestion other than diet.
Appetite and hunger.
Exercise. External temperature.
Baths.
Temperature of food. Congestions.
Emotions.
Sleep. Eye strain.

Lecture 23.
The Hygiene
of Excretion.

3. Excretion.

Intestinal waste.
Composition of colon content.
Effect of diet on colon content.
Regularity of evacuation.
Intestinal lag.
Special cathartics and gentle aperients.
Shaking of viscera in exercise.
Good general body tone. The vicious
or benign cycle.

The excretion of the kidney.

Normal appearance and composition
of urine.
Diet and the work of the kidney.
Water drinking.
Effect of muscular work; of emotions.
Effect of external temperature.
Quack alarmism.

Lecture 24.
The Hygiene
of Excretion.
The Skin.

The lungs.

The skin.

Structure.
Excretory and heat regulating func-
tions.
Clothing.
Shedding one's skin.
Bathing.

Kinds of baths.

For vasomotor exercise.

For cleanliness.

Soap.

Bathing and exercise; and sleep; and feeding.

Congestions.

Sunburn and tanning.

Cosmetics.

Skin infections. Nails. Corns.

Lecture 25.
What is Good
Air—for
Respiration?

C. Environment.

1. Air.

a. In relation to respiration.

Composition of pure air.

Composition of air in the lung sacs.

Changes produced by breathing.

Symptoms produced by stuffy air.

Their cause.

Classic examples of extraordinary
vitiation of respired air.

Sea air. Mountain air. Night air.

Dust and bacteria.

Poisonous gases.

Ozone.

b. In relation to skin sensation and body temperature.

The background of consciousness
and the effect on it of the air-
skin contact.

The normal body temperature.

The balance of income and outgo.

Results of disturbance of balance.

The aerial blanket.

Practical corollaries. Draughts.

Lecture 26.
What is Good
Air—for Skin
and Mucous
Membrane?

Temperature and humidity in relation to the respiratory tract.

Humidity at low temperatures.

2. Light.

In relation to the eye.

In relation to the skin.

Lighting systems.

3. Micro-organisms:

and the healthy body,

and the diseased body.

Classification of diseases.

History of the prevention of "fevers".

Causes of "fevers".

Germ theory of disease.

Relative destructiveness of different diseases.

Susceptibility according to age.

Conflict with disease-producing microbes.

Offense.

Defense.

Skin and mucous membranes.

Vital resistance.

Immunity.

Lecture 27.

Health and
Disease.

Lecture 28.

The Conflict with
Disease.

Lecture 29

Health and
Inheritance.

II. Racial Hygiene.

III. Sanitation.

1. Personal hygiene and public health.
2. The health situation in community life.
 - a. Foods and drink from common sources.
 - b. Housing. Parks and playgrounds. Schools. Gymnasias. Baths. Streets.
 - c. Disposal of sewage.
 - d. Education and propaganda.
 - e. Isolation of infection.
 - f. Immunization.
3. The college—a parcel of the public health. The problems there offered.

Lecture 30.

The Public
Health.

LECTURE OUTLINES.

Following each lecture outline will be found the assigned reading for that lecture in the text book of the course, Hough and Sedgwick's *The Human Mechanism*. Thoughtful reading of the text and lecture notes is a primary requirement. Further, special supplementary references are given, Fisher and Fisk's *How To Live* being freely used, as well as other simple, standard presentations of different parts of the subject—posture, exercise, mental hygiene, diet, etc. The references are arranged in the order of the subheadings of the lecture outlines, and also, roughly, in the order of their importance as lecture supplements in this course.

Based on lecture notes, regular text reference, or on one or more of the supplementary references, weekly class assignments will be made in the form of a question or problem. The answer or solution should be placed in the space provided—on the lower part of the fourth blank page following each lecture outline.

Syllabi may be called in at any time.

LECTURE I.

Introduction.

The college course—work and play.

What does or what may it mean to the entering student?

One requisite to substantial success—health.

The importance of health in the opinion of leading men and nations.

The purpose of the course—to explain the conditions (as thoroughly as we may) of physical health and effectiveness, *i.e.*, to present some of the “rules” of health with their scientific justification, with pointed reference to the present situation—the situation of college living.

Significant facts of physiology. Theories that lead to results. The application may be made immediately.

Mrs. Jellyby’s coal-hod and the natives of Borrioboola Gha.

Some of the Problems of Immediate Personal Significance.

Posture. Correct and incorrect carriage. Manifold relations to health and efficiency. How are we sitting and standing?

Exercise. Its crucial importance and the many reasons therefor.

Nervous and muscular fatigue. A stitch in time, etc.

Eye strain. Its recognition. Its avoidance. Its far-reaching effects.

Diet. The immediate source of the body’s energy. Heavy eating or light eating. Vegetables vs. meats.

Ventilation. The requirements. Class and sleeping rooms.

Congestions. Wraps—in and out of doors. Draughts.

The study and care of health—general good-natured disregard, especially among young people.

Some of the reasons—abundant vitality, dislike of preaching, appreciation of the lecturer's hypocrisy.

Live questions of today concerning public and individual health.

Over emphasis on hygiene. Introspection that leads to harm. Hypochondria. "Health should be subconscious." But too often half-health is subconscious.

The human body as a mechanism; as an organism.

The definition of Personal Hygiene. (See Foreword.)

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 291-296.

References: Fisher and Fisk, *How to Live*, pp. 1-6.

Adams, *The Health Master*.

Mackenzie, *Health and Disease*, (pp.7-23.)

(The student should become conversant during the first two months with the general structures and functions of the body as outlined on pages 3-54 and 65-69 in *The Human Mechanism*, and with "Hygiene in General," the subject of Chap. V (pp. 119-168) in *How to Live*.)

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE II.

Muscular Exercise.

I. The problem.

The human being resembles his biological relatives, the lower animals, in possessing a basic equipment of muscles, nerves, and other organs. He differs from them in his superior intelligence—complete memory, surer judgment, and more purposeful control of muscular action. But by virtue of his high grade wits, the man or woman of today is prone to evade physical exertion, delegating it to laborers and machinery. Is this a tendency that should be fostered? Can the person who aims at the largest efficiency, logically and safely permit his muscular equipment to fall into disuse at any time of life? If not, what are the best means, the true purposes, and the limitations of muscular training, and how can the effects of exercise be predicted and explained by physiology?

II. Physical work—a function of the normal animal mechanism.

1. Means—the muscles.

- a. Skeletal muscle—largely under control of will.
- b. Heart muscle and that in the digestive organs, etc.
—not under control of will.

2. Control of muscular action.

The controlling mechanism—brain and spinal cord.

Nerves which command (efferent nerves).

Nerves which inform (afferent nerves).

3. Number and arrangement of muscles. Amount of muscle tissue in the body.

III. Modern tendencies. Labor saving machinery. Effortless transportation. Sports and athletics for the elect few.

IV. Deliberate muscular deterioration irrational. The muscles are the mind's laboratory. An educated muscle sense as—

1. a biological necessity,
2. part of the mind's activity,
3. a means of being socially effective (expression and impression),
4. a hygienic necessity.

V. Commonly observed results of sedentary habits.

1. Concerning diminished physical effectiveness for immediate, practical ends.
 - a. Loss of muscle tone.
 - b. Lowered strength and endurance.
 - c. Poor posture.
2. Concerning the discounting of general effectiveness and of prolonged capacity for work, mental and physical.
 - a. Poor posture.
 - b. Accumulation of fat.
 - c. Weakening of the automatic functions.
 - (1) Constipation.
 - (2) Heart power limited.
 - (3) Regulation of distribution of the blood in various organs erratic.
 - d. Lowered "vital resistance" to disease.

VI. What are the results, and the reasons underlying them, of systematic muscular exercise?

1. The law of use and disuse. Examples showing the effects of normal muscular function and of muscular stagnation.
 - a. The biology of growth.
 - b. General biology.

Muscular degradation and parasitism.

2. Changes brought about in the muscles themselves by their systematic use.
 - a. The muscle as a harnessed team. The ability to use the whole of it.
 - b. Consequent good tone.
 - c. Correct posture made possible.
 - d. Chemical and physical changes that take place in the muscle mass during exertion.
 - e. Increased lymph flow. Changing the cell environment.
 - f. Consequent increase in quantity and improvement in quality of muscle cell substance.

Summarizing in part and passing to the next lecture: Systematic exercise improves the *power plant* of the body, making for better motor efficiency and for better health. But furthermore the deep-seated chemical readjustments that take place in muscle tissue during vigorous exercise, react upon, stimulate and indirectly strengthen the organs of the body whose business it is to minister to the muscles, supplying their needs with fuel and oxygen and removing the waste products of their activity.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 304-320.

Reference: Fisher and Fisk, *How to Live*, pp. 94-96.

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LECTURE III.

Muscular Exercise (continued).

3. Improvement in organs of the body other than the muscles, making possible *continued* motor efficiency, sound health, and large vital capacity.

a. Circulation.

- (1) Heart. Variation of its work with the amount of physical work done.

Inability of the heart to rise to the occasion, the chief reason, as a rule, for embarrassing lack of endurance.

Training the heart to cope with any reasonable requirement of endurance.

Training the heart possible only through muscular exercise.

- (2) Arteries. Blood pressure and arterial elasticity.

The nerve mechanism which controls the amount of blood flowing through the various regions of the body—the vasomotor system.

Importance of steadiness combined with flexibility in its action.

Irregular and erratic action of the vasomotor system—congestion.

Exercise of the vasomotor system. Forestalling congestions and breaking up incipient congestions.

- ##### b. Respiration. Deep breathing. Forced breathing not an adequate substitute.

Effects of deep breathing on the breathing muscles; on lung tissue; on lymph flow.

Habitual deep breathing.

c. Digestion and nutrition.

The increased demand of active tissue for nutriment—for fuel, for repair, and for construction of new tissue.

Response to this demand in heightened appetite, increased absorptive capacity, and firmer tone of muscle tissue in digestive system.

Greater promptness and economy in cellular consumption of fuel.

d. Excretion. Complete definition of the term. Elimination from intestine, kidneys, lungs, and skin.

4. Increased “vital resistance” to disease

VII. Clothing. Free locomotion and respiration. No constrictions. Opportunity for aeration.

VIII. Exercise in relation to meals, sleep, bathing, and external temperature.

IX. Exercise for men and women compared.

X. Formal and informal exercise.

1. Types of formal exercise. Their theory. Their influence for health and efficiency. Physical education.
2. Informal exercise. Walking. Running. Horse-back riding. Bicycling. Sports. Effects on posture.

XI. Overdoing. The heart. Dilation. Degenerative changes. The nervous system—its increased susceptibility to fatigue after a certain stage and in certain types of muscular training.

XII. Concluding comment.

Neglect of the fundamentals of action in the effort toward greater intellectual progress, means not progress, in general, but decadence. Efficiency for individual and nation, social usefulness and wholesomeness, sound health, and length of life, are materially limited by muscular desuetude and inepti-

tude. "Much of that degeneration of the higher class is the natural result of the loss of personal incentive to action. It is the laziness and weakness engendered in the pampered and sheltered life. In the society in which this form of degeneracy appears we find a maximum of sense impression and a minimum of action. *Where thought does not go over into action a sort of mental dyspepsia is produced.*"

Improved health, greater strength and staying power are matters of common observation in connection with well regulated exercise. We have some knowledge of the reasons underlying these. The reasons relate chiefly to the great mass of muscle tissue itself whose working and resting conditions are improved by systematic use. This improvement and increase in muscle function is the complex cause of a more vigorous, reliable heart action, of enhanced digestive and assimilatory power, of deeper respiration, and of completer excretion, the total effect being a broadened, deepened, and lengthened living capacity.

The arguments against misdirected, unsuitable, or excessive exercise are as cogent and important as those in favor of exercise properly guided. They concern the impairment of posture and the undermining of the basic machinery of the body, the heart and nervous system.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 132-176.

Reference: Hutchinson, *Exercise and Health*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE IV.

Posture.

1. The problem.

Given a mechanism consisting (1) of supporting parts, the bones; (2) the muscles which hold and move these parts; (3) the nerves which control the action of the muscles; and (4) an inert mass of viscera suspended in the upper part of the bony frame. This mechanism is adjustable to certain familiar type positions—standing, sitting, reclining. Is there more than one way of taking these positions—of adjusting and establishing the architecture of the body? If so, is there a best way? How can one judge if he is standing or sitting correctly? If there is a best way to stand and sit, what are the reasons, conservatively stated, for its superiority and what are the probable results of neglecting to learn and adopt it? What are the means by which one can develop and make habitually by correct body positions?

II. The mechanics and architecture of the body in motion and at rest. Posture as a phase of exercise.

1. General plan.

- a. The bone framework.
- b. Passive connectives—ligaments and cartilages.
- c. Active connectives—muscles. The latter's unremitting control by the nervous system.

2. Mechanical difficulties involved.

- a. The upright position of the trunk.
 - (1) Skeletons of cat and man compared.
 - (2) Saw-horse and upright jointed rule compared.
- b. The consequent necessary delicate muscular adjustments, and changed manner of visceral suspension.
- c. The small base of support.

3. The conditions of modern life and their usual unfavorable influences on posture.

III. Various types of body position commonly seen.

Illusions produced by clothing.

Popular judgments of correct carriage often in error.

IV. Correct standards.

1. Standing.

a. Feet. Position. Configuration. Height of heels above the ground.

b. Relation of long axes of legs, trunk, head and neck.
The "vertical line test."

c. Abdomen and small of the back.

d. Chest and shoulders. Position of shoulders relative to ear when head is erect. Shoulder blades.

e. Placing the weight. The position of maximum height and easy balance.

2. Sitting. Writing. Reading.

3. Lying.

V. Analysis of some of the chief postural defects and their manner of origin.

1. Feet.

a. Mis-shapeness.

Types of shoe lasts. Tennis shoes. Low or high heels?

Shoes and toe exercise.

Shoes producing weakened arches.

b. Toeing-out position. Position of weakness. "Weak ankles." Defective arches.

2. Spine. Abnormal fore-and-aft curves.

a. "Fatigue position." Spine in the shoulder region too curved; that in the small of the back, too straight.

b. "Bantam position." The reverse of the "Fatigue position."

c. The exaggerated S-shaped curve.

3. Corresponding positions of the pelvis.

4. Corresponding positions of head and neck.
5. Lateral spinal curvature.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 321-333, 403-412.

References: Fisher and Fisk, *How to Live*, pp. 57-64.
Bancroft, *The Posture of School Children*,
Chaps. I and II.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE V.

Posture (continued).

VI. Wherein lies the value of correct carriage and in what ways, precisely, does poor carriage decrease physical effectiveness?

1. Good posture results in greater efficiency in the long run for the body as a whole.
 - a. Positions are held and movements are made from those positions of good carriage with a minimum of waste effort and a maximum of alertness and efficiency. (Apparent exceptions.)
 - b. Viscera are advantageously placed. (Their nice, normal spacial relations and adjustments.)
2. Habitual poor posture reduces efficiency and impairs health.
 - a. Wasted energy in maintaining and acting from ill-balanced positions. Contrariwise, lack of vigor as the cause of these positions.
 - b. Loss of muscle tone—cause and effect of wrong positions.
 - c. Weakening of the skeletal architecture.
 - d. Malformations of bones.
 - e. Interference with nerve trunks and their blood supply.
 - f. Interference with the operation of the viscera; their blood supply.
 - (1) Pelvic organs in a pelvis tilted toward the horizontal.
 - (2) Abdominal sliding with a hollow back and pelvis tilted toward the vertical. Suspension of liver, stomach, etc.
 - (3) Lungs and heart under a flat chest.
 - g. The dead-line of habit in posture.
3. Good posture and self respect. Posture oft proclaims the man. The cash value of good posture.

VII. What are the means of attaining and maintaining correct carriage?

1. General exercise. Its limitations under the complex conditions of modern life.
2. Dress.
3. Physical education leading to consciously localized muscular control.
4. Prescription of special exercise.
5. Habit formation.
6. The danger for the unguided of misapprehension and aggravation, or over-correction.

VIII. Concluding comment.

Exemplary carriage has a clearly demonstrable aesthetic, monetary, and efficiency value, which is amply sufficient to recommend, to any thinking person, its study and cultivation. It has in addition a health value some of the reasons for which are on a solid scientific basis, while others are not so clearly provable. It can do no harm, however, to accept the health argument for posture at something more than its scientific face value.

Correct carriage need not occupy the mind as an obsession for unceasing classic postural perfection. There are many occasions when it is necessary to adopt for considerable periods of time other positions than those of standard carriage. The chief things to guard against are allowing any slovenly position to become habitual, or any attitude necessitated by special occupation to go uncorrected by properly planned exercise.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 321-333.

References: Fisher and Fisk, *How to Live*, pp. 221-226.
 Bancroft, *The Posture of School Children*,
 Chaps. XI and XV.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE VI.

Thought, Mood, and Habit

I. The problem.

It is an obvious fact that muscles act in quite exact harmony for the attainment of certain ends. It is not so well appreciated that the many parts of the body—heart, lungs, glands, etc.—play their many apparently separate roles in nice agreement with each other. To guide thus the action of muscles and to administer the joint operation of heart, lungs, digestive and excretory organs, there is a special governing part of the body mechanism—the nervous system, consisting of sense organs, brain, spinal cord, and nerves. Its administrative duties such as hastening or slowing the heart beat, enlarging or constricting certain blood vessels, governing the action of glands, are performed in entire independence of the will. In this field it is its own master. But its function of receiving information from the outside world through the sense organs and of guiding muscular action with the brain is fused with that foremost of all realities—consciousness, self, mind.

It is, then, with the operation of the mind, one part only of the nervous system's multiple function, and with the coloring of the frame of mind, moods and emotions, that we are concerned chiefly in the present lecture. The conduct of thought and the control of mood have an important bearing on health, while general health has a close relation to the smoothness, accuracy, and tirelessness of our mental performance. Some of the problems are: How much mental work? When may it best be done? Can work in itself be dangerously exhausting? How to apply mental lubricants, pleasant moods and emotions? How can we explain the softening effects on character of emotions cultivated for their own sake?

II. Sensory impressions; registry of impressions; meaning of impressions. Judgment action. Reflex action. Habits.

III. Study. Connotations of the word.

1.] Habits of study.
2. Influence of environment.
Obliviousness to environment. Value of. Nervous strain involved.
3. Attention.
Being "hard at work."
When work is play—trivial interests forgotten.
4.] Time of day for best work. Individual differences.
5. Study soon after meals?
6. Special diet for mental work?
7. Amount. Distribution. Cramming.
Eyestrain. Posture.

IV. Moods and emotions. Composites of physical and mental states.

1. Worry. A condition of mind and body.
Some of the causes of worry.
 - a. Scattered attention. Attention to extraneous and intervening matters instead of the immediate thing to be done.
 - b. Past mistakes, real or imagined.
 Work vs. worry.
When worry is advisable.
2. Other obstructive mental twists.
 - a. Hypochondria. Insistent and abnormal introspection.
 - b. Doubting. Fear. The various "phobias."
3. Antidotes.
Habits of optimism and their physical basis.
Democratic companionships.
Outdoor sports—good winners and good losers.
Theater. Fiction.
4. The pleasant but demoralizing emotions. Emotion without action. The maudlin mind.

V. Physical reinforcement of emotion. "Character leakage."

VI. Concluding comment.

In all personal hygiene the most elusive and impalpable subject is that dealing with mental exercise and mental attitude. The muscles, the posture can without much effort be looked upon and studied as one studies food and air and other things outside one's self. If one surveys the body in a mirror, he can with proper guidance detect errors of symmetry, carriage, and condition. But the mirror we hold before the mind is the mind itself. Our minds are ourselves. If the one be crooked so is the other correspondingly warped, and the reflected image appears to the satisfied self-student to be straight and balanced.

The more important is it therefore to learn the indirect ways by which we may come to "know ourselves"—first to see others as they really are, their mental working methods, their emotional foibles, their strong and buoyant moods; second to use this objective knowledge to correct the twist in our own mental mirror, "see ourselves as others see us"; and then to set about developing habits of mental industry and eliminating emotional friction and egotism.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, p. 204, par. 21; p. 344, par. 11 and 12; p. 353, par. 9.

References: Fisher and Fisk, *How to Live*, pp. 89-93, 97-99, 105-118.

Stiles, *The Nervous System and its Conservation*, Chap. XIII.

Stiles, *Human Physiology*, pp. 163-166.

James, *Habit*.

Walton, *Calm Yourself*.

Walton, *Peg Along*.

Walton, *Those Nerves*.

Walton, *Why Worry*.

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LECTURE VII.

Fatigue.

I. The problem.

It is a familiar and sometimes discouraging fact that activity, physical or mental, is inevitably hampered and limited by fatigue. This condition makes itself known in two ways: By producing a sensation of diffused but unmistakable nature, the sensation of fatigue; by limiting, in spite of increased determination, the performance of work. Is moderate fatigue merely an annoyance, or does it serve a valuable purpose? What is fatigue physiologically? Is there a special sort of fatigue for the muscles and another for the nervous system? What may be the effects of fatigue bordering on exhaustion? Is the obliteration of fatigue by drugs such as alcohol, tobacco, or caffeine (coffee) hygienically legitimate? What are the normal means of reducing the amount of fatigue in the day's work and play?

II. Muscular exertion. Its effect on muscles, heart, nerves. Extreme fatigue a disease condition.

Fatigue as an automatic deterrent to over exertion.

The sensation of fatigue.

The condition of fatigue.

III. The causes of fatigue.

1. Exhaustion of the stored fuel of the body.
2. Wearing out of machinery of muscle and nerve cells.
3. Accumulation of waste products of muscle and nerve cells.

Their transference through the body in blood and lymph.

IV. The results of these changes.

1. The sensation of fatigue.
2. The condition of fatigue produced by the giving out of one or more parts of the —.

V. The muscle-nerve combination.

The chain of structures in this combination.

Body of the nerve cell; nerve fibre leading from it;
the end-plate; the muscle fibre.

Relative strength of the links.

VI. Internal secretion and fatigue.

VII. Muscular remonstrance to the parts of the nervous system that command or limit muscular action.

VIII. The influence of environment on fatigue. The nature of the action of spurring stimuli. Functional stimulants.

External temperature. "Bracing cold." "Spring fever."

Light. Sound. Encouragement.

IX. The cure and prevention of fatigue.

1. Rest. Varied activity or inactivity.
2. Food.
3. Avoidance of poisons other than fatigue products—e.g., intestinal poisons.
4. Lessening the waste of muscular awkwardness and antagonism.
5. Hardening the mechanism by training.
6. The use of drugs to efface fatigue.

X. Nerve fatigue—connected with
neuromuscular activity;
with mental work alone;
with worry and kindred mental states.

XI. Characteristics of fatigue which primarily affects the nervous system.

Increased irritability. The vicious cycle.
Headache.

XII. Neurasthenia. Nervousness.

1. Predisposition.
2. Causes. Difficulty of distinguishing between causes and
3. Symptoms.

4. Treatment.

General hygiene. Rest. Diverted attention. "Mind cures."

XIII. Concluding comment.

It should be clear that since it is fatigue that puts a temporary or a chronic ban on effective work, it is desirable to understand it thoroughly in order to consider ways and means of postponing its appearance, of limiting it in amount, and of distinguishing real fatigue from its mirage—laziness.

Well adjusted rest reservations result in a saving of work and an improvement in quality of work in the long run. This will be the subject of the next lecture.

Accustoming the nerves and muscles to increasing doses of activity will develop a resistance to fatigue. Such training includes attention to diet, avoidance of intestinal sluggishness, and all the points of correct personal hygiene. In addition it is permissible to use the natural or functional stimulants—changing interests that will continue to hold the flagging attention.

Prolonged physical or much mental work impeded by harassing moods is likely to lead to a species of fatigue differing from the general type. It is characterized either by increased irritability and ill-timed, perverted, and fruitless bursts of activity, or by obstinate mental languor—"brain fag." Keep well within the limits of nervous endurance.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 55-62; 316; 334-338; 345-346.

References: Stiles, *The Elements of Fatigue, Science Conspectus*, III, 2, 1913.

Stiles, *The Nervous System and its Conservation*, pp. 192-215.

Stiles, *Human Physiology*, pp. 166-169.

Courtney, *The Conquest of Nerves*.

Walton, *Why Worry*.

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LECTURE VIII.

Rest. Vacations.

I. The problem of resting in the right way and at the right time is not as simple as it may seem. Certainly it is not often correctly solved in practice. Observation shows many who reserve little or no time, aside from sleep, for recuperation, and more whose resting time is far in excess of need. In the former class deterioration in work and health results from the constant handicap of fatigue or from occasional acute exhaustion. In the latter, work is vitiated by being too highly diluted with rest, and mind and body lose tone and vim.

We may first take up specific instances of functions of the body and of management of business and educational organization which show the physiological, hygienic, and cash value of rightly distributed recreation periods. Conclusions from these observations may then be used in working out a schedule, more or less elastic and suitable for individual needs, of relaxation, amusement, and tasks of different kinds.

II. The aim of muscular exercise and mental training—a healthy mechanism and well sustained activity. Most work with least fatigue.

III. The means of attaining the best working capacity.

1. Passively by the cure of fatigue—properly timed rest.
2. Actively by postponing and preventing fatigue—training.

IV. Some facts proving the advantage of periodic recuperation.

1. The nature of the heart's action.
2. Standing vs. walking.
3. The ergograph.

The load to be lifted or resistance to be overcome.

The time between efforts.

The length of rest needed for recuperation when action
is continued beyond the beginning of fatigue.

Sustained vs. single efforts.

Effects of massage.

4. Examples from commercial reform.

Rest requirements in manual labor.

Maintenance of mental alertness.

5. The hare and the tortoise.

V. Quality of work done under the handicap of fatigue.

"The curve of work."

VI. Rest. Kind of rest depending on the type and cause of fatigue.

VII. Practical programs.

The day's work.

Eight hours' sleep.

Real relaxation between recitations.

Siesta.

Relaxed position between periods of games.

The after dinner half-hour.

The week's work.

Saturday afternoon "rest."

One day in seven.

The year's work.

The common sense of vacations.

VIII. Sleep.

1. The necessity for sleep—personal differences.

2. Depth of sleep.

3. Dreams.

4. Hours of sleep.

5. Sleep and diet. Meals. Exercise. Baths.

6. Sleeplessness.

IX. Concluding comment.

The gospel of work has never suffered from lack of preachers. The gospel of rest has always been under suspicion. But real rest, regardless of appearances, is quite legitimate; it makes possible more and better work. Time not spent at work is usually regarded as resting time. It may be quite as fatiguing as formal work due to lack of power of relaxation or to the fact that, spent at too strenuous play, it involves the use of the same muscle or nerve units as those used during the work itself. It may be simple indolence and procrastination, the boon companions of laziness.

Relaxation need not follow the first sign of fatigue; resistance would never be built up. Relaxation or change of occupation should intervene when fatigue seriously affects the quality of work. Continued application beyond this point means more time lost in the long run than would be lost in wisely distributed breathing spells.

Balancing one form of activity against another may not be done incautiously. Change of occupation is not necessarily rest. There is no *a priori* rule. Personal trial must be made.

Assigned readings: Hough and Sedgwick, *The Human Mechanism*, pp. 338-343.

References: Fisher and Fisk, *How to Live*, pp. 98-105.

Stiles, *Human Physiology*, pp. 169-171.

Stiles, *The Nervous System and its Conservation*, pp. 173-191.

Walton, *Why Worry*, pp. 147-165.

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LECTURE IX.

Use and Care of the Eye.

I. The problem.

Everyone knows that brilliant light irritates and inflames the eyes. Anyone can easily demonstrate that objects at different distances from the eyes, provided they are not all thirty feet or more away, can not be seen clearly at the same time. We are all familiar with the prevalence of eye defects as shown by the number who wear glasses, and we may be sure that there are many who should wear them but do not. Upon these three considerations rests the major part of the theory and practice of the care of the eyes: (1) the presence within the eyes of a lining of tissue, the retina, sensitive to light but injured if the latter is too intense; (2) the presence therein of a nerve-muscle mechanism which must be in an almost continuous state of varying adjustment in order to bring objects at different distances from the eyes successively into focus; (3) unrecognized and uncorrected defects of vision.

II. The receiving end of the nervous system. Eye, ear, and organs of odor, taste, and touch.

III. Structure and operation of the eye.

IV. Tax imposed on the eye by modern civilized life.

V. Chief structural defects.

1. Near-sightedness or myopia.
2. Far-sightedness or hyperopia.
3. Astigmatism.

VI. The results of uncorrected structural defects. Eye strain.

VII. Means of correction.

- Expert prescription.
- Lens fitting.

VIII. Practical matters in regard to the use of the eyes.

1. Illumination.

a. Indoors. Kind of light. Arrangement of lights.
Cross lights. Light and shade.

Indirect illumination. Color of walls, ceiling, and
woodwork.

b. Outdoors. Reading and fine work—in diffused
light—in sunlight on snow or sea.

2. Moving objects. Moving pictures. Reading in moving
vehicles. Strain on ciliary and ocular muscles.

3. Size of print and quality of paper. Length of line in
printed matter.

4. Needlework.

5. Position of head and book.

6. Rest for the eyes.

7. Proper fitting and wearing of glasses.

Spectacles.

Pincenez.

IX. Symptoms of abuse.

1. Blurring.

2. Headaches.

3. Indigestion, watering and inflammation of the eyes,
and other reflex effects.

X. External affections.

1. Granulated lids.

2. Infections.

XI. Abrasions.

XII. Concluding comment.

Of all the outposts of the brain, the eyes, upon which we put our chief reliance for information, are perhaps the most delicately adjusted, and at the same time of necessity in the most exposed position and the most seriously affected by modern

conditions of occupation. Other sense organs are *passive recipients* of stimuli and they receive them now in the same way as they did in primitive times. The eyes, on the other hand, when in use, are *actively engaged*, and are engaged a good part of the time in close work, an occupation quite foreign to the primitive human animal. Consequently they may readily be over-active—to the point of abuse. Abuse of the eye consists (1) in using them under unfavorable light conditions; (2) in not applying the principles of fatigue and rest to the delicate mechanism which is so constantly in operation to maintain sharp focus, to the muscles which control the size of the pupil, and to the muscles which rotate the eyes; and (3) in forcing them to work under the handicap of visual defect such as far-sightedness or astigmatism.

Abuse of the eyes may have effects far distant from the source of the trouble, as when it is the cause of headaches, nervous fatigue, or indigestion.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 246-256; 395-401.

Reference: Pyle, *Personal Hygiene*, see Table of Contents, "*Hygiene of the Eye.*"

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LECTURE X.

Ear, Nose and Throat.—Colds.

I. The problem.

The middle ear, nose, and throat are connecting chambers. Defects or infections in one are often followed by defects in the others. These defects, if allowed to continue, may interfere with respiration, hearing, and with the proper development of the teeth, and may serve as a base of operations for invading microbes.

II. The ear.

1. Structure.
2. Positive hygiene—limited. "Let it alone."
3. Avenues of possible injury.
 - a. External canal—attempted removal of earwax; entrance of foreign objects; great concussions.
 - b. Eustachian tube—infection by too strenuous nose-blowing; infection by unwise use of nasal douche.
4. Earache. Cause; prevention; relief.
5. Special medical prescription for any abnormality.

III. Nose. Its structures and functions.

1. Nose vs. mouth breathing.
2. Cause of mouth breathing.
 - a. Adenoid growth.
 - b. Defective nose bones.
3. Nasal affections. "Cold in the head." Catarrh.
 - a. The effect of dry air on the membranes.
 - b. The effect of cold air.
 - c. Nervous congestion of the nasal membrane.
 - d. Bacterial infection.

IV. "Throat." Pharynx.

1. Tonsils.
 - a. As possible obstructions and entries for infection.
 - b. Opinions on the desirability of their removal.

2. Base of the tongue. Its cleanliness.

V. Larynx.

1. Care and cultivation of the voice.
2. The disagreeable voice—singly and ensemble.
Cause and effect of worry and nervousness.

VI. Summary:

VII. Concluding comment.

The hygiene of ear, nose, and throat includes little that is positive and preventive. One may, however, learn to recognize some of the defects that may develop, such as blocked breathing passages or enlarged and easily infected tonsils, and to appreciate the importance of skilled medical examination and treatment for any suspected difficulty.

"Colds" are usually associated largely with infections and inflammations of the nasal passages and throat. They are often much more wide-spread through the body and deep-seated, often owing their origin primarily to low general vitality and to congestions, rather than to any mere special incidence of virulent microbes upon the membrane of nose and throat.

Colds are responsible for a large economic loss in any community. Medical advice never comes amiss at the first suspicion of a cold. There are, however, certain common sense precautions and non-medical curative procedures that any layman is entitled to know.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 258-261; 380-394; 401-402.

References: Pyle, *Personal Hygiene*, see Table of Contents, "*Hygiene of the Ear.*"

Fisher and Fisk, *How to Live*, pp. 272-280.

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LECTURE XI.

Food Requirements—Qualitative.

I. The problem.

To live one must eat. For the average person this statement represents the extent of thought on the questions of the uses of food. Indeed, surprisingly many look upon the taking of food largely as a pleasant prescription of nature for their diversion and gratification.

When man lives the "natural" life, working physically for the actual food he consumes, such casual appreciation of the purposes of food may suffice. Instinctively he chooses the kind and amount needed. But it is evident that a large portion of mankind is living under conditions that are far removed in their complexity and artificiality from those which surrounded primitive man. Instead of laboriously encouraging food to grow or slaying it after strenuous chase, most of us are engaged in some one of the sedentary or sitting-down occupations of modern civilization, the income from which we exchange in part for food which some one else has raised or killed. The amount, variety, and quality of food eaten depends now, therefore, not enough upon physiological requirements, too much upon financial means and artificial tastes.

Living, then, as we do and as we must, it is clear that there are problems concerning the choice and use of food which can not be trusted to solve themselves. The discussion may best be opened by considering the definition of a food, the type substances of which all foods are composed, and the role played by each in the body's nutrition.

II. Articles of diet.

III. Definition of food and foodstuffs.

Classification of foodstuffs.

IV. What purposes, separately and in common, do the food-stuffs and other articles of diet serve?

1. The chief foodstuffs.

a. Protein. The composition of the tissues.

The fact of constant waste.

The necessity of repair. Protein, indispensable for this purpose.

Differences among proteins for repairing.

Vegetable and animal proteins compared.

Desirability of a variety in the diet.

Fuel value of protein.

b. Carbohydrates.

Use as fuel.

Transformation into fat for storage.

Essential to the successful use of fats and proteins both in repair and in production of energy.

c. Fats.

Use as immediate source of energy.

Stored as adipose tissue.

Serves as a lesser repairing and building material.

2. Other articles of diet.

a. Water.

Its amount in the body.

Its presence in foods.

The need of water as such in the diet.

b. Salts.

Their function. Occurrence in the diet.

c. Vitamines. Elements of food likely to be lost in over-refining.

d. Stimulants.

e. Condiments, flavors, etc.

V. Concluding comment.

All working mechanisms wear out in the course of their activity and therefore need *repair*. Food performs this repairing function in the constantly active and therefore constantly wasting tissues of the living mechanism.

All mechanisms do work through the utilization of a something which it has been found convenient to name *energy*. But no mechanism, not even the body, can make or in any way conjure up its own energy. The energy of motion of automobile or locomotive is derived from that contained in gasoline or coal and released by the process of burning. In the living engine, the energy of motion and of heat is derived from that stored in foods and is liberated by chemical changes which these substances undergo in the tissues of the body.

These, then, are the two chief uses of foods: As a repairing or growth-producing *material*; as a source of *energy*.

All food, in its many forms, is composed of a few basic classes of substances, the *foodstuffs*: *protein* (principal constituent of meat and white of egg), *carbohydrates* (examples—sugar, starch), *fats* (olive oil, butter), *water*, *mineral substance*, and *vitamines*. Only the first three furnish energy. The first is the great essential repairing and growth-producing stuff, but also serves as a source of energy. The second and third serve primarily as sources of energy (fuel) but in a secondary way as repairing material. The last three will be considered later.

It is necessary to establish these fundamental conceptions firmly before proceeding to the practical hygiene of nutrition.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 88–93; 217–233.

References: Jordan, *The Principles of Human Nutrition*, pp. 148–157.

Stiles, *Nutritional Physiology*.

Stiles, *Human Physiology*.

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LECTURE XII.

Minor Constituents and Accessory Articles of Diet.

I. The problem.

The minor constituents of the diet, *water, salts, and vitamines*, are so called not at all in the sense that they are dispensable.

The accessories in the diet, on the other hand, coffee, tea, alcohol, condiments, flavors, etc., are certainly in large part not required. Cautious consideration of these artificial additions to the diet is necessary to establish the limits of their usefulness.

II. Water.

The maintenance of the water content of the body.

Ample water in the diet to

- (1) improve digestion, absorption, and intestinal peristalsis;
- (2) ease the work of the kidneys;
- (3) induce perspiration.

III. Salts. Function in the diet. Special importance during growth.

Table salt as a relish.

IV. Vitamines—Nature's "impurities."

1. Definition.
2. Effect of eliminating them from the diet by over-refining and by heating. *E.g.* polished rice, white flour, sterilized food, cooked food.
3. Danger only with restricted diet.

V. Raw foods.

VI. Stimulants.

1. Coffee.
 - a. The stimulating constituent. The flavoring constituents.
 - b. Its physiological effect.
 - c. Points in its favor.

- (1) Postpones fatigue.
- (2) Stimulates the heart.
- (3) Acts as a diuretic.
- (4) Excites mild perspiration.
- (5) In moderation, stimulates digestion in the stomach.
- (6) Stimulates peristalsis.
- (7) Pleasant flavoring material.

d. Points against.

- (1) Strong coffee retards digestion.
- (2) The coffee habit.
- (3) Heart palpitation and muscular tremors.
- (4) Use by children.

e. Sanction, limitation, or proscription of coffee drinking according to age, temperament, and occupation of the individual.

2. Tea. Coffee and tea compared.

3. Cocoa.

Food and stimulant value compared with tea and coffee.

Sweet chocolate.

4. Confectionery. The American temperance bar.

5. Alcohol. Its value. A stimulant?

a. As a relish; b. a food; c. drug; d. cerebral alterative; e. alcohol as a poison.

6. Condiments and extractives.

a. Beneficial action,

May promote flow of digestive juice.

b. Harmful action.

For the former—normal vs. artificial hunger; inflammation of the digestive tract.

For the latter—imposition of fatigue products on the body mechanism.

VII. Concluding comment.

Water as a beverage and as a part of almost all foods is a

prime requisite, as everyone knows. However, mistakes can be made in judging of its potability and of the proper amount to be consumed. Overdosing, under stress of warm weather or exhausting physical exertion, is not unusual. The more common failing is a chronic underestimate of the body's need of water.

The adult probably obtains his proper requirement of mineral matter in any diet which is well balanced with regard to its major constituents. With children, however, there is often need of constant watchfulness to prevent mineral starvation and its consequences.

Vitamines need not concern us as a matter of immediate practical hygiene, since it is more than likely that in the variegated diet of the well-to-do, these important substances are always present in sufficient amounts. However, the subject is very new, and one may well preserve a mind open to the conclusions of future experimental and statistical research.

Something can be said in favor of the use of the various accessories, coffee, tea, spices, etc., since they have well recognized temporary beneficial effects as stimulants and as promoters of digestion. Nothing, however, can be said in favor of their unrestricted and unintelligent use.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 219, 354, 361-376.

References: Fisher and Fisk, *How to Live*, pp. 64-69, 227-244.

Lusk, *The Fundamental Basis of Nutrition*, pp. 36-40.

Stiles, *Nutritional Physiology*, pp. 217-219, 224-226, 227-237.

Stiles, *The Nervous System and its Conservation*, pp. 218-223.

Stiles, *Human Physiology*, pp. 171-173, 341-351.

Jordan, *The Heredity of Richard Roe*, pp. 145-147.

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LECTURE XIII.

Vegetarianism and Meat Eating.

I. The problem.

Nearly everyone has some acquaintance or relative who eats no meat. There have always been a few such people in the western world and a considerable number in Asiatic countries. Their reasons for eschewing meat have been various and fragmentary, sometimes fantastic, and often connected with religious vagaries. But of recent years there have been scientific studies that may be interpreted to lend a modicum of support to vegetarianism. In this lecture, therefore, the arguments that have been advanced for confining the diet exclusively to vegetable materials will be reviewed.

II. Grades of vegetarians.

III. Some of the claims for vegetarianism.

1. Humanitarian and moral claims.
2. Competitive tests and individual examples.
3. All-sufficiency of vegetables.
4. Man, anatomically, an herbivorous animal.
5. Economic arguments.

IV. Arguments for and against meat eating.

1. For.

- a. The human instinct.
- b. The human dentition and intestine.
- c. Lack of evidence that meat eating leads to deterioration of character.
- d. Relative effects of the embracing of vegetarianism and the simultaneous renouncing of bad habits.
- e. Competitive tests and individual examples.
- f. Diets of races.

- g. Assuming need of ample protein, the difficulty of getting it from a moderate bulk of vegetables.
- h. Natural flavors of meat improve digestion.
- i. Meat proteins more easily and completely absorbed.

2. Against.

- a. Meat eating favors overindulgence.
- b. May aggravate rheumatic disease.
- c. May lower the general tone by taxing the mechanism of excretion.
- d. May favor growth of undesirable bacteria in intestinal tract.
- e. May introduce diarrhoeal infection.

V. The moderate view.

VI. Concluding comment.

It is impossible to establish any sweeping conclusion in favor of vegetarianism. Undoubtedly many persons thrive best on such a diet. Undoubtedly many have been benefited by the renunciation of meat. On the other hand there is nothing to show that food of animal origin is in itself anything but a normal constituent of the diet of the majority of people. There are several assured and important advantages in taking a large fraction of one's protein supply in the form of meat. Intemperance and extravagance in meat eating, however, commonly accompanied as they are by a general lack of attention to the conditions of health, are of evil hygienic consequences. Furthermore the temptation to overindulge in the flesh foods is less likely to be resisted than is the temptation towards gormandizing on a diet of cereals, nuts, carrots, parsnips, and beans. Economic as well as hygienic reasons make it desirable to limit the amount of meat in the diet.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 240-243.

References: Stiles, *Nutritional Physiology*, pp. 219-221.

Lusk, *The Fundamental Basis of Nutrition*, pp. 27-35.

Fisher and Fisk, *How to Live*, pp. 197-199.

Jordan, *The Principles of Human Nutrition*, pp. 246-257.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XIV.

Food Requirements—Quantitative.

I. The problem.

A laborer requires more food than a clerk or teacher. A person instinctively demands more food in cool than in warm weather. A child needs more food in proportion to his weight than an adult.

From these observations and others that one may call to mind, it is evident that not only are there questions of *kinds* of food and their uses, but also questions of *amounts* of food needed under different circumstances. The purpose of this lecture will be to explain the means of measuring food consumption, of gathering together in terms of a simple fundamental explanation, the observable differences in quantitative needs, and in establishing certain quantitative food standards.

II. The two salient quantitative requirements.

1. Sufficient protein for tissue repair.
2. Sufficient fuel (protein, carbohydrate, fat) to heat the body and furnish energy for work.

III. Methods of measuring fuel. Bulk vs. food value.

1. Weight units.
2. Energy units.

IV. The CALORIE. Its determination.

V. The heating value of the three foodstuffs.

VI. The body's material income and outgo.

The irreducible minimum of protein for the body's repair.

VII. The energy balance sheet of the body. Potential energy income = kinetic energy outgo + heat energy outgo—energy of any foodstuff stored. Experimental proof.

VIII. The lower limit of energy outgo per day of an individual of given weight at rest.

1. The effect of digestion of food.
2. The effect of exercise.
3. The effect of mental work.

IX. Variation of the energy outgo with

1. Size (surface area of the individual).
2. Age and sex.
3. Climate conditions.

X. Type combinations of the foodstuffs that will furnish the required energy.

XI. Concluding comment.

Measurements of commercial food substances in weight units are quite inconclusive, since foods differ greatly in degree of concentration. Therefore all quantitative statements must be made in terms of the weights of the separate foodstuffs contained in a given mass of commercial substance, or, more conveniently, in terms of the energy, available for the body, therein contained.

The cells of the body in their living activity are constantly losing part of their substance. This loss is apparent to us in the escape of water from the lungs and of water containing a large variety of substances, in the form of urine. Unless one is gaining or losing weight, this loss of substance is exactly made good by the food eaten. Of this total material loss to the body, that derived from the protein portion of the tissues must without fail be equalled by the protein in the food.

In doing work and in maintaining its temperature, the body expends energy, as the phrase is. This expenditure, with the same provisos about gaining or losing weight, must be balanced by an income of equal amount in the form of available potential energy stored in the food eaten. Energy expenditure and income are measured in terms of the unit of heat (one form of energy), the *Calorie*.

The food needs of the body, then arrange themselves around these two central requirements: (1) a sufficient quantity of protein in the diet to make good the constant loss of that material from the active tissues; (2) a sufficient supply of energy in the diet as a whole to approximate that expended in the form of work and in the form of heat.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 211-217.

References: Lusk, *The Fundamental Basis of Nutrition*, pp. 1-26.

Jordan, *The Principles of Human Nutrition*, pp. 142-169.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XV.

Should the Diet be Barely or Amply Sufficient?

I. The problem.

There has always existed an unpopular feeling, in a somewhat vague and distant sympathy with vegetarianism, that, on the whole, man eats more than is necessary or healthful. Such a feeling, unsupported by scientific study, would be classed as a timid notion akin to puritanical superstition of the presence of evil in all instinctive pleasure. However, the conclusions from certain important scientific investigation support this idea that mankind does eat, when it has the means to satisfy itself, more than it should eat.

This, then, is the question—is there sound reason for a general artificial curbing of the appetite. Special questions concern us more. Does the college student class correctly gauge its quantitative food requirement? On what basis can the individual decide his own problem?

II. Individual bias.

III. The interdependence of questions of quantity and quality. The central position of protein in the argument.

IV. Dietary insurgents, ancient and modern.

V. The results which both systems claim to attain.

1. Physical endurance and resistance to disease.
2. Physical strength.
3. Mental clearness and power.
4. Emotional stability.
5. Long life.

And underlying these,

6. A properly exercised digestive tract.
7. A non-poisonous intestinal content.

8. Comfortably loaded excretory organs.

9. Elastic circulatory system.

A. How a meager dietary is supposed to accomplish these results. Its attack on abundance in diet.

a. Experimental evidence of such accomplishment. The New Haven experiments.

b. The reliability of appetite as a guide to feeding.

(1) Primitive vs. civilized conditions.

(2) Historical evidence. National success, cause or effect of ample diet?

(3) Popular impressibility.

(4) Cultivation of extravagant tastes.

c. Moderation of demands on intestinal tract.

d. Avoidance of intestinal poison.

e. Avoidance of wear and tear on excretory organs and accumulation of fatiguing substances.

f. Avoidance of overweight.

B. How an abundant diet claims to accomplish these results. Its counter attack.

a. Criticism of the above experimental evidence.

(1) Too short duration.

(2) Reversion.

(3) Picked subjects and comfortable conditions.

(4) Abundant variety of food.

b. Some of Crichton-Browne's criticism.

c. High feeding treatment against disease.

d. Factors of safety in the mechanism of metabolism.

VI. Examples of the quantities recommended in the two systems.

VII. Reservation of judgment.

Danger of set rules in all conditions of life.

Personal experiment and individual self-judgment.

VIII. Concluding comment.

The questions considered in this lecture have nothing to do with bulk of food consumed, which may be made up largely of water and non-absorbable material, very important in other connections but not here. They concern the weight of absorbable foodstuffs eaten and the energy therein contributed to the body's operation. To one of the foodstuffs, protein, especial attention must be paid, since a large allowance of protein is often accompanied by a large consumption of foodstuffs in general and vice versa, and since protein is held responsible for the more serious of the alleged evils of hearty eating.

It is quite impossible to say a final word in the general discussion of the correctness of modern mankind's choice of food as to quantity. Scientific studies, monumental as they are considered by themselves, have not been, in comparison with the magnitude of the whole problem, of sufficient duration and extent. Arguments based on the eating habits of one line of human stock are not likely to be closely applicable to those of another. The lack of homogeneity of populations, the facts of over-self-gratification amongst the idle classes, the pressure of poverty among the working masses, and other factors greatly confuse the problem.

However, we may express a cautious opinion in regard to the diet of persons in adult youth, in good health, not already under weight, not engaged in exacting manual labor, furnished with a variety of food, living in pleasant surroundings. It is fairly safe to say that such persons are benefited as a rule by a reduction of the diet to an amount not much greater than that theoretically needed by the body to perform its daily physical work. Probably, also, the protein of the diet may well be reduced to a figure not much in excess of the theoretical requirement. It has been recommended by some authorities that not more than ten or fifteen per cent of the body's total energy income should be in the form of protein.

Individual judgment—compute your own quantitative food requirement, preferably with the help and advice of your medical advisor if he is familiar with recent studies in the physiology of nutrition. Put your computation into practice for months and years, keeping careful watch of body weight and physical and mental condition. If you are “naturally” a light and apathetic eater, beware of malnutrition. But if you incline toward overweight, make thorough trial of strictly *temperate* eating.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 347–348; 351.

References: Stiles, *Nutritional Physiology*, pp. 207–215.

Stiles, *Human Physiology*, pp. 356–357.

Stiles, *An Adequate Diet*.

Lusk, *The Physiological Basis of Nutrition*, pp. 27–35.

Fisher and Fisk, *How to Live*, pp. 34, 37–40.

Crichton-Browne, *Delusions in Diet*.

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LECTURE XVI.

Dietaries.

I. The problem.

Thus far diet has been reviewed in its general aspects. It remains to give definite and concrete examples of the different combinations of foodstuffs that have been recommended as suitable for the different periods of life, for different types of occupation, to increase or decrease weight, etc.

II. During growth.

1. Excess food needed—
 - a. to build up new tissues;
 - b. for instinctive activity;
 - c. on account of larger proportional body surface.
2. The double danger of disproportionate sugar feeding.
3. Salts.
4. Sample meals and foods.

III. Diet of the adult under varying conditions.

1. Mental work.
 - a. The fish and phosphorus superstition.
 - b. Patented foods.
 - c. Fatty diet and brain activity.
 - d. Increase meat and reduce fat and carbohydrates to forestall abnormal weight increase? Decrease meat and increase carbohydrate ration to avoid constipation and autointoxication?
 - e. Choice of food for digestibility.
2. Muscular work.
 - a. Carbonaceous or nitrogenous foods?
 - b. The amount corresponding to the expended energy.
 - c. Muscle tissue building.
3. To increase weight.

4. To decrease weight. Obesity.
 - a. Fatty degeneration and adipose accumulation.
 - b. Causes of obesity. The vicious cycle.
 - c. Dietary prevention and cure.
5. Climate and clothing.
6. Age.
7. Size.
8. Sex.
 - a. and the kind of food chosen;
and the amount of food chosen.
 - b. Normal reasons for the difference between the
sexes in diet. Unnecessary differences.
9. Dietaries in student life.

IV. Concluding Comment.

Like house furnaces and locomotive engines the human machine needs to be "stoked" in accordance to the varying conditions it is called upon to meet. The most important of these conditions are external temperature, changing with the seasons, and the amount of work done. Furthermore, as with furnaces and engines, the factor of size enters, a large man or woman, other things being equal, requiring as a rule more fuel than a small person.

The comparison could be carried further, but with scant profit. We will, therefore, drop it and speak of the changing conditions for the human body incident to changing age. The human machine grows and during growth requires wisely chosen rations for building material and at the same time for fuel to supply the energy for the wellnigh perpetual activity which is a condition of growth. As age advances beyond maturity the human machine suffers a perceptible weakening of function until in middle life and old age, the body, quite a different thing from the resilient instrument of youth, requires food chosen with special reference to avoidance of autointoxication.

Tendencies toward under- or over-weight are often insidious and obstinate, but may usually be checked and corrected by proper attention to the kind and amount of food eaten.

Adaptation of habits to living conditions, and the control of conditions so as to make the adaptation gradual are the central purposes of personal hygiene. Nowhere is the adaptation of habits to living conditions of greater import than it is where habits are *habits of eating* and conditions are those of the comparatively *sedentary life*. If we are well informed, we can be sure of a rationally adjusted diet. If not we are likely to make damaging and ludicrous mistakes. Become accustomed to stating food requirements in terms of weights or proteins, fats, and carbohydrates, and in terms of total energy content. Such statements are in clear, simple terms, capable of no misinterpretation, and may then be transformed into actual menus by reference to suitable tables.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 233-240.

References: Fisher and Fisk, *How to Live*, pp. 28-35, 171-197, 212-220.

Jordan, *The Principles of Human Nutrition*, pp. 200-225, 260-299.

Stiles, *Human Physiology*, pp. 361-362.

Stiles, *Nutritional Physiology*, pp. 194-195, 215-216.

Locke, *Food Values*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XVII.

Preparation. Cost. Menus. Adulteration.

I. The problem.

The study of diet in terms of its constituent foodstuffs and of its content of available energy is prerequisite to a sound understanding of the subject. But based upon this fundamental knowledge one must establish a working knowledge for practical results. Such a working knowledge has already been alluded to in the transference of foodstuff specifications into menus. In addition it is well to know something about the different forms in which food appears on the market, the effects of various methods of food preservation, the effects of cooking, and the foodstuff composition of common foods. Furthermore something should be said on the subject of adulteration. Finally an important vantage point from which the hygiene of diet may be surveyed in a peculiarly impressive light is that of cost.

II. Forms of marketed foods.

III. Preservation.

1. Sterilization by heat. Effect on vitamins.
2. Drying. Concentration. Smoking. Canning.

IV. Adulteration.

1. Harmful ingredients.
2. Cheapening ingredients.
3. Preserving ingredients of doubtful status.
4. Misbranding.

V. Cooking. Purpose. Modification of food values.

VI. General facts.

1. Watery foods and dry foods compared.
2. Foods rich in protein.

3. Foods rich in starches and sugars.
4. Foods rich in fats.
5. Sources of various kinds of mineral matter.
6. One-sided foods.

VII. Cost.

1. The most suitable standard for judging money worth of food—weight standard or fuel value standard?
2. Vegetable and animal foods compared.
3. Cost among vegetable and among animal foods.
4. The digestible portion.
5. Waste.

VIII. The rock bottom of cost.

The necessary increment for enjoyment.

The unnecessary increment for enjoyment.

IX. Overeating and social parasitism.

“The simple life.” “The strenuous life.”

X. Sample menus.

XI. Concluding comment.

A few ways of preserving foods have been known since very remote times, *e.g.* drying, smoking, pickling. Aside from this, food was bought and sold by our forefathers in its natural state—on the hoof and out of the field. Now, steam sterilization (in the canning industry), cold storage, “refined” chemical preservation, unnumbered inventions for disguising cereals, machinery for baking bread, and for stamping and baking the thousand and one varieties of cookies and crackers—these and many other modern contrivances have made the grocery store of today resemble more a pharmacy than the produce market of fifty or a hundred years ago. Obviously a very sudden change, if not a revolution, has occurred in the method of preparing and marketing our food supply. All sudden changes in the en-

vironment of living creatures are fraught with danger for the latter. Speaking in general terms there are elements of danger for the human race in this rapidly evolving situation. Specifically, we cannot yet say, unfortunately, exactly what these elements of danger are. They will probably be found to have to do with the loss of mineral material and vitamins from foods by refinement and heating, with the effects of regular doses of "artificial" preservatives, and with the predigestion and pre-mastication of foods. It is surely not an unreasonable precaution so to regulate the diet that it shall consist not too largely of food dispensed in cans and cartons.

The cost of food sufficient to sustain life is wonderfully little. The cost of a sufficient variety of food to make life enjoyable is somewhat greater. But even the comparison of the latter figure with our customary food expenses, shows clearly that living to eat and living to waste are too common.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, p.349.

References: Jordan, *The Principles of Human Nutrition*, pp. 226-245, 312-319, 334-342.

Folin, *Preservatives and Other Chemicals in Food*.

Olsen, *Pure Foods*.

Lusk, *The Fundamental Basis of Nutrition*, pp. 41-51.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XVIII.

Digestion.

I. The problem.

Food as served is obviously unfit for use by the cells of the body. It must first undergo profound changes in the process of digestion. This process involves both mechanical and chemical action. By such action the digestible portions of ingested food becomes a liquid capable of easy absorption through special structures in the walls of the intestinal tube into the circulating fluids of the body. The salient aspects and some of the details of structures and operation of the digestive apparatus will be reviewed in this lecture.

II. General consideration of the digestive tract. Purposes, manner, means of digestion.

1. Prealimentary digestion.
2. Alimentary digestion.
 - a. The mechanical and chemical means.
 - b. Blood supply and nerve control.

III. Mastication.

1. Its double purpose.
2. Foodstuffs affected.
3. Salivary digestion in the stomach.

IV. Swallowing.

V. Digestion in the stomach.

1. Mechanical action. Size of the stomach.
2. Gastric juice.
 - a. The psychic initiation of gastric flow.
 - b. The continued stimulation by arriving food.
 - c. The amount of digestion and absorption and the kinds of foods treated in the stomach.

VI. Digestion in the small intestine.

1. Escape of the food, piecemeal, from the stomach.
2. The movement of the intestines.
Forward march. Marking time.
3. Digestive juices in the intestine.
 - a. From the pancreas.
 - b. From the liver.
 - c. From the intestinal lining.
4. The foodstuffs affected by these and absorbed.

VII. Large intestine. Recovery of water.

VIII. Concluding comment.

For the prompt and rapid digestion of food two processes must go on without interruption. First there must be firm, well ordered movements of the walls of stomach and intestine, of different types as above described. Second there must be manufacture of digestive reagents in the digestive glands at the proper times and in proper amounts. Both of these activities depend upon unhampered though unconscious control through the nervous system of these muscles and glands and of their blood supply.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 96-128, 155.

Reference: Stiles, *Nutritional Physiology*, pp. 54-104.

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LECTURE XIX.

The Care of the Teeth. The Hygiene of Mastication.

I. The problem.

Cuts, bruises, infections will heal; the injured parts become sound again. But an infected tooth will not mend itself. The disintegration can only be arrested with plugs and patches. Decayed or ill arranged teeth have an influence upon digestion, upon physical efficiency and soundness much more extensive than many of us know or suspect. These are cogent reasons for understanding precisely the care and foresight necessary to prevent dental deterioration.

In the first stage of alimentary digestion, mastication, the two fundamental digestive processes are plainly illustrated,—the mechanical action of the teeth and the chemical action of the saliva. But there are many who regard mastication as the briefest possible preparation for the act of swallowing. On the other hand there are enthusiasts who advise a performance so protracted as to be almost ludicrous. There is not a doubt that fine subdivision of the food in the mouth and the action of certain chemical reagents of the saliva upon starches and starch derivatives are portions of the digestive process that can not be habitually and flagrantly omitted without ultimate disaster. But is the second extreme right because the first is wrong?

II. Development and structure of the teeth.

Influence of diet; of disease.

The tooth, a living thing.

III. The influence of imperfect teeth.

1. On digestion.

2. As a nest for undesirable bacteria which pass,

a. To the alimentary tract;

b. To the blood stream.

3. Odors. The expiratory nuisance.
4. Appearance.

IV. Imperfections.

1. Dental caries.
2. Tartar.
3. Pyorrhoea.
4. Abscesses.
5. Irregular arrangement.

V. The beginnings of cavities.

1. Acid fermentation in the mouth and softening of the enamel. Imperfect enamel.
2. The mucous plaque.
3. Bacterial action.
4. Kinds of food that favor decay.
5. Composition of saliva. Its relation to dental caries.

VI. Prevention.

1. Examination—biennial, at least.
2. Removal of detritus.
 - a. Brush where the brushing is needed.
Amount of cleansing needed. Frictional stimulation.
 - b. Dental floss.
 - c. Tooth picks.
 - d. Powders and pastes.
3. Mouth washes. Virtues, real and alleged.
4. Diet.

VII. What is tartar?

Its accumulation. Encroachment below the gums. Removal.

One of the causes of pyorrhoea.

VIII. Root abscesses—blind and leaking. Their supposed effects—nervous and bacteriological.

IX. Orthodentistry.

X. The hygiene of mastication.

1. The so-called American sin.
2. Historical and parental admonition.
3. Fletcherism.
 - a. Its claims. Individual experiences.
 - b. Its effects—on digestion;
on amount of food taken and on waste eliminated.
 - c. Confirmatory experiments.
 - d. Criticisms.

XI. Concluding comment.

Dental prophylaxis is founded upon three precedures: First regular and frequent inspection by the dental surgeon; second complete removal of food particles from the mouth at least daily—preferably oftener; third the use of some foods that must be gnawed or vigorously crunched.

There is indubitable evidence of extraordinary improvement in endurance and in general condition resulting from mastication carried, it would seem, almost to the limit of thoroughness. However, without advocating bolting of food, it must be said that there is reason to believe that the same results may come from mastication which is thorough but promptly terminated—which falls somewhat short of rumination.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 98–101, p. 349, paragraph 3.

References: Brackett, *The Care of the Teeth*.

Pyle, *Personal Hygiene*, pp. 17–25.

Stiles, *Human Physiology*, pp. 362–363.

Fisher and Fisk, *How to Live*, 200–209;
also see index for “teeth.”

Stiles, *Nutritional Physiology*, pp. 210–211.

Fletcher, *The A.B.-Z. of Our Own Nutrition*.

Fletcher, *Fletcherism, What it is*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XX.

Digestion. Influence of Diet.

I. The problem.

Among the many forms of food some are generally considered refractory toward digestive processes while others have a reputation for mildness and amenability—*e.g.* pork and soft-boiled eggs in the two cases respectively. What are the standards for differentiating among foods as to their digestibility? How much attention should be paid, by the normal, healthy individual to this phase of dietary hygiene? What are the causes of indigestion?

II. Digestibility of food.

Meaning of the term—covers—

- | | | |
|--|---|------------------|
| a. Completeness of digestion and absorption. | } | (Absorbability.) |
| b. Rapidity of digestion and absorption. | | |
| c. Comfort of digestion. (Digestibility.) | | |

III. Absorbability of the chief foodstuffs.

1. From animal sources.
2. From vegetable sources.

IV. Influence of structure of food on absorbability and digestibility.

1. Influence of cooking on structure.
 - a. Solution.
 - b. Gelatinization.
 - c. Coagulation.
 - d. Changes in starches and sugars.
2. Absorbability and digestibility of various foods and foodstuffs.

- A. a. Protein. b. Starches, Sugars, Cellulose. c. Fats.
 B. a. Meats. b. Soups. c. Eggs. d. Milk. e. Vegetables. f. Breads. g. Pastry. h. Puddings.

V. Water and digestion.

1. The absorption of water.
2. Hot water. Ice water.
3. Waters of varying composition and properties.
4. With meals.

VI. Condiments.

VII. Alcohol.

VIII. What is indigestion and what are its causes?

1. Stomach, small intestine, colon—relative frequency.
2. Possible causes.
 - a. Poisoning.
 - b. Incomplete mastication.
 - c. Over-feeding.
 - d. Deficient secretion.
 - e. Fermentation.
 - f. Incomplete elimination.

IX. Individual peculiarities.

X. Dangerous combinations—myths?

XI. Concluding comment.

There are many instances of *bone fide* incompatibility between a given food and a given individual. There are many persons in subnormal physical condition who must choose foods circumspectly on the basis of digestibility. On the other hand there is probably no phase of personal hygiene that has received such exaggerated, superstitious, neurotic attention. It seems likely that, if physical stamina is maintained by common sense attention to other items of personal hygiene—exercise,

sleep, etc.—the person of normal constitution should choose what he wishes to eat without considering, certainly without worrying over, theoretical relative digestibility. This suggestion must not, however, be taken as advocating continued indulgence in the notoriously intractable culinary concoctions, such as moist breads and heavy, complex pastries.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, p. 352, paragraph 6, pp. 354–356.

References: Jordan, *The Principles of Human Nutrition*, pp. 114–126.

Stiles, *Nutritional Physiology*, pp. 219–224.

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LECTURE XXI.

Autointoxication.

I. The problem.

Autointoxication, particularly intestinal autointoxication has become a slogan in popular hygiene and a catchword in advertisements of patented foods and laxatives. This in itself would breed distrust rather than confidence in the importance of the condition which the word describes. In autointoxication, however, we have a condition on which too much stress cannot be laid.

Organic matter, especially protein, if left to itself in the presence of microbes, in warm, moist, dark surroundings, putrifies—becomes offensive and poisonous. Obviously there is ample opportunity for putrefaction to occur in the large intestine. What are the effects of the chronic condition of autointoxication and how can they be minimized?

II. General significance of the term.

III. Intestinal autointoxication.

1. Intestinal content—its nature.
2. Content of the large intestine.
 - a. Food left-over.
 - b. Excretions from walls of intestine.
 - c. Bacteria.
3. Composition of food waste.
4. The two types of decomposition.
5. The bacteria of the tract.
 - a. The two chief types and their action on the food waste.

First type (*Bacillus coli* and allied organism) feeds on carbohydrates preferably.

Second type (putrifiers) prefers proteins.

- b. The checking action of *Bacillus coli* on putrifying bacteria when carbohydrates are present.
- 6. Substances, poisonous and offensive, that may be formed in the large intestine and absorbed into the blood under unhygienic conditions.
- 7. Their possible role as prime or secondary factors in muscular fatigue, nervous irritability, neurasthenia, somnolence, hardening of the arteries, rheumatism, anaemia.

IV. Prevention and eradication of autointoxication.

- 1. Prompt digestion and absorption.
- 2. Regularity of bowel movement; good peristaltic tone.
- 3. Avoidance of putrefactive bacteria.
How far can food disinfection be carried?
- 4. Reduction and inhibition of putrefactive bacteria by—
 - a. Intestinal antisepsis.
 - b. Laxatives.
 - c. Fermented milks.
- 5. Regulation of diet.

The teachings of Graham and Fletcher.

V. Concluding comment.

The contents of the large intestine (undigested food, excretion from intestinal walls, and bacteria, dead and alive) must for practical reasons be retained for some time—the shorter the better. But during that time it is in a situation where conditions for putrification are ideal. Poisons which may there be formed may also be absorbed through the walls of the colon into the blood and lymph streams. This intestinal self-poisoning is a widespread and insidious cause of lack of physical endurance, of much mental muddiness, of somnolence, headache, and general lowered vitality and efficiency. Proper balancing of the foodstuffs of the diet, cleansing of food, water drink-

ing, the use of fruits, of fermented milks and of bulky, coarse, branny foods, (roughage) are some of the means of forestalling autointoxication. By the overenthusiastic on the subject of bulky, "natural" foods, roughage is sometimes confused with rubble and rubbish.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, p. 125, paragraph 37, pp. 128–131.

References: Stiles, *Nutritional Physiology*, pp. 206, 213.

Stiles, *Human Physiology*, pp. 353–356.

Metchnikoff, *The Prolongation of Life*.

Kellogg, *Colon Hygiene*.

Douglas, *The Bacillus of Long Life*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXII.

Factors in Digestion Other than Diet.

I. The problem.

The existence of a few forms of food that are proverbially hard to digest; the stress laid on relative digestibility of foods for invalids; the fact that often the apparent reason for sudden disorder in the pampered or the browbeaten digestive system is the eating of some stubborn substance—these things have given rise to the impression that the salient factor in successful digestion is the quality of the food itself. But it should be easy to see that the action of a mechanism so complex as the digestive apparatus may be affected in many different ways. Comparative quiet or violent exercise soon after meals, complete or incomplete mastication, a pleasant or an unpleasant frame of mind, well or ill regulated use of the eyes are some of the favorable and unfavorable influences upon digestion.

II. The normal appetite. Nature of hunger.

1. Their normal, regular recurrence.
2. Natural and artificial stimulation.
 - a. Sauces and spices.
 - b. Physical exercise and low external temperature.
 - c. Mental activity.
 - d. Pleasant anticipations and associations.

III. Successful digestion.

1. Its dependence on the nature of the food. (See previous lecture.)
2. on blood supply to intestinal tract and glands, and on nerve control of the latter's secretory activity.

IV. Favorable and prejudicial influences.

1. Violent physical exercise before and after meals.
2. External temperature.
3. Warm and cold baths.
4. Temperature of the food.
5. Thoroughness of mastication.
6. Congestions.
7. Frame of mind.
 - a. Pleasant companionship.
 - b. Pleasant odors and tastes.
 - c. Homesickness. Worry. Despondency. Excitement.
8. Sleep. Reciprocal effects.
9. Eyestrain.

V. Concluding comment.

Successful digestion depends (1) upon the sustained, coordinated control, by means of the nicely adjusted sympathetic nervous system, and by means of messages carried by the blood from one part of the digestive machine to another, of the activity of the glands and muscles of the digestive tract; and (2) upon an adequate blood supply to the aforesaid glands and muscles. Influences favorable to digestion allow free opportunity for expeditious, harmonious muscle and gland action. Unfavorable influences create discord and confusion in the operation of the controlling mechanism, or divert much of the blood needed by the digestive apparatus to other parts of the body. For example an unpleasant or excited frame of mind often puts a stop to mechanical and probably to secretory digestive action. Vigorous physical exercise diverts an unfair share of the body's blood supply to voluntary muscle and skin.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 264-265, 350; 352, par. 7-353.

- References: Stiles, *Nutritional Physiology*, pp. 204-207.
Stiles, *Human Physiology*, 352.
Fisher and Fisk, *How to Live*, extracts
from pp. 28-44.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXIII.

The Hygiene of Excretion.

I. The problem.

Reference as already been made to the material balance sheet of the body—the equivalence of food income and waste outgo in weight of material. The waste disposed of through intestines, kidneys, lungs and skin is said to be excreted. The actual gross elimination, as for example perspiration or the expiration of water and carbon dioxide from the lungs is but the most superficial aspect of excretion. Back of this lies the cell activity of sweat glands, kidney mechanism, lung tissue, etc. Still further back, in the cell mechanism of all parts of the body occur the deleterious changes which result from partial blocking of the excretory processes or any defect in the function of the excretory organs.

II. The main avenues of waste disposal.

1. Intestines.
2. Kidneys.
3. Lungs.
4. Skin.

III. Intestinal waste.

1. The composition of the colon content.
2. The effect of diet on colon content.
3. Regularity of evacuation.
4. Intestinal lag—regular tardiness.
5. Special cathartics on occasion only.
6. Gentle aperients as regular parts of the diet.
 - a. Water.
 - b. Fruit.
7. Moderate shaking of the viscera in exercise.

8. Stimulating action of exercises involving abdominal muscles.
9. Importance of good general body tone.

IV. Excretion via the kidneys.

1. The normal appearance of urine and constituents thereof.
2. Diet and the work of the kidneys. Protein. Salt. Sugar.
3. The effect of exhausting muscular work—of violent emotion.
4. Amount of urine in hot and cold weather.
5. The prime importance of water. Other diuretics.
6. Normal irregularities in composition and appearance of urine. Quack alarmism. "Pains in the small of the back."

V. The lungs. Carbon dioxide and water.

VI. The skin.

VII. Concluding comment.

Substances which are formed in the life processes of the cells of the body and for which they have no further use are considered poisons, although, taken by themselves, they may not be so classified in common parlance. No obstacle should be placed in the way of their speedy elimination.

Intestinal waste is unique in that it consists of excretion from the walls of the intestine and also of food residue in process of decomposition. The danger here lies not in connection with the process of excretion itself, but in the possibility of reabsorption of the products of this decomposition. The danger may be obviated by diet control, and by ensuring by means already discussed regularity of evacuation and vigor of intestinal peristalsis.

With the kidney excretion the discussion hangs upon the welfare of the organs themselves under different dietary regimes. The subject is still obscure. Probably extravagant

protein consumption puts too heavy a load upon organs already laboring under a complex strain. Certainly plenteous water drinking lightens the work of these important excretory filters.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 177-181; 128-131.

References: Galbraith, *Personal Hygiene and Physical Training for Women*, pp. 113-115.

Stiles, *Human Physiology*, pp. 315-320.

Fisher and Fisk, *How to Live*, pp. 51-56.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXIV.

The Hygiene of Excretion. The Skin.**I. The problem.**

Two outstanding facts regarding the skin should be thoroughly appreciated: Its extent—obvious enough; its incessant multiple activity. Not only does this great organ dispose of much water and some organic and mineral material in its excretory capacity, but, what is probably more important, it is a sensory organ, an organ by means of which the temperature of the body is held at a constant level, and a protective organ. It is, further, the mother substance of hair, nails, and teeth.

II. Structure of the skin.**III. The skin's excretion.**

1. Its importance as disposer of waste often unduly magnified.
2. Shedding one's skin.
3. The heat-regulating function of perspiration.
4. Clothing.

IV. Bathing.

1. Kinds of baths.
 - a. Russian, Turkish, etc.
 - b. For vasomotor exercise primarily.
 - c. For cleanliness primarily.
 - (1) Soap.
 - (2) The pores. The skin fabric.
2. Cold plunge or shower.
 - a. Duration.
 - b. Regulation of temperature.
 - c. How soon after exercise?
 - d. Reaction.

- e. The shower and needle baths. Mechanical effects.
- 3. Baths in relation to sleeping and feeding.

V. Skin and mucous membranes. Congestions.

VI. Sunburn. Tanning.

The nature of the processes.

Beneficial effects—fictitious and otherwise.

VII. Cosmetics.

VIII. Skin infections.

1. Avenues for the entrance of bacteria.
2. Acne. "Blackheads." Enlarged pores. Boils.
3. Prevention and treatment.

IX. Care of the hair.

1. The essentials to good hair. Blood supply.
2. Dandruff. Dry and oily scalp.
3. Cleansing, brushing, massage.

X. Nails. Corns.

XI. Concluding comment.

There has been much exaggeration in popular thought concerning the importance of the skin as an excretory organ, the necessity, from the hygienic standpoint, of frequent ablutions for the removal of excreted material, the danger of "open pores" after a bath, and so on. Regular cleansing of the surface of the body is a matter chiefly of decency and of avoiding microbe infections. Among the class of people who are accustomed to regular, frequent, and thorough washing, the effects upon the skin of the removal of the natural oil, the properties of soaps, the temperature and duration of the bath, etc., are matters for serious consideration. Further, there are questions on the use of cosmetics, the care of hair and nails, which have been discussed in the lecture and thoroughly treated in the appended references, but which are too detailed to be summarized.

As a sense organ the skin in normal operation contributes to the stream of the mind a great undercurrent of touch and temperature sensations, some of the distinct ripples in the form of discriminating touch sensations, and now and then the sudden, unpleasant, sharp swirls and swift cross currents of warning pain sensations. So it serves in normal operation. For special occasion, to stimulate the mind wearied by business or professional problems, or to flush out corroding moods of worry or fear, this great sense organ can be played upon by baths involving numberless combinations of pressure, temperature, and light, and by rubs of various sorts.

Serving this function in part is the ordinary cold shower. It also serves as an efficiency trial for the vasomotor system, training and testing that part of the nervous system in its ability to shift the mass of flowing blood from skin to internal organs and back again on short notice—a congestion drill as it were. Cold baths should not be taken inadvisedly. They should be so arranged as to duration and temperature as to be pleasant and exhilarating, not feats of endurance and martyrdom.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 181–186; 413–424.

References: Galbraith, *Personal Hygiene and Physical Training for Women*, pp. 11–79.

Fisher and Fisk, *How to Live*, pp. 273–275.

White, *The Care of the Skin*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXV.

What is Good Air—for Respiration?

I. The problem.

It is commonly said that since life without air can endure for a much shorter time than without drink or food, therefore care in regard to the healthfulness of the air supply in and out of doors takes precedence over precautionary measures concerning water and food. Though this does not by any means follow, it can not, of course, be denied that the condition of the air which surrounds us seriously affects comfort and health. This is an observation that can easily be made upon ourselves and upon those about us. But we may also observe that except under extreme conditions all members of even a small group are almost never satisfied at the same time with the ventilation of room or hall. This might lead us to suppose that the rules and principles underlying the proper regulation of atmospheric conditions of buildings are not as yet understood. The supposition would be correct. It has long been supposed that the benefit of good air depends upon its chemical purity and that the evil effects of bad air depend upon the fact that it is polluted by impurities of the breath. We will examine this theory.

II. The composition of pure air.

III. The composition of air in the lung sacs.

IV. Changes produced in room air—in kind and in amount—by breathing.

1. Reduction of oxygen.
2. Increase of carbon dioxide.
3. Odors and organic substances.
4. Increase of moisture.
5. Rise in temperature.

V. Symptoms of stuffy air. To what are they due?

1. To the chemical changes above?
 - a. The lower limit in the oxygen supply.
 - b. The upper limit of carbon dioxide.

Are they ever reached in ordinary experience?

2. To unknown chemical changes of which the above are indices?
3. To odors and mental suggestion?
4. To rising temperature and humidity.

VI. Classic examples of extraordinary vitiation of respired air.

VII. The instinct for "chemically pure" air.

The danger of trying to make it replace exercise.

VIII. Sea air. Mountain air. Night air.

IX. Dust and bacteria in the air.

X. Poisonous gases.

Illuminating gas—in the home—in the laboratory.

Leaky furnaces.

Gas and coal stoves.

Tobacco smoke.

XI. Ozone.

1. As a normal constituent.
2. Artificial ozonizers.

XII. Concluding comment.

The well known symptoms of stuffy air are sometimes felt out of doors when the temperature is high and the air is moist and still. Since outdoor air is of standard purity, we may conclude that the absence of all impurity is not the sole requirement of successful ventilation. In fact there is no known impurity of respiration whose presence in amounts ordinarily found in indoor air can be shown to have in itself any ill effects.

This does not mean that we may rest satisfied with stale indoor air, even though it is artificially cooled and in motion. The practical fact is incontrovertible as far as we can see now, that for daily living, year in and year out, there is no substitute for *fresh*, outdoor air in large doses night and day.

Many forms of dust irritate the lining of the breathing passages. Any sort of dust in respirable air should be avoided. The danger from air-borne bacteria has been much overrated.

The presence of illuminating and coal gas indoors in amounts sufficient to cause oxygen starvation, headaches, and nervousness is probably more common than is generally supposed.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 162-176.

Reference: Fisher and Fisk, *How to Live*, pp. 7-27.

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LECTURE XXVI.

What is Good Air—for Skin and Mucous Membranes?

I. The problem.

The skin has been described as a great sensory organ and as a regulator of body temperature. We have also intimated that temperature, humidity, and motion of air were the salient features in good and bad ventilation. The two statements placed side by side should suggest an explanation, in part at least, for the bracing and enervating effects of fresh and used air respectively, and for the effects of different kinds of weather.

II. The background of consciousness—skin sensations—pressure and temperature sensations.

Presence or absence of such sensations as air is still and warm, or moving and cool.

Incentive to liveliness or cause of lethargy.

III. The normal body temperature. Its precise regulation.

1. The balance of heat supply and heat loss.
 - a. Conditions at low temperature.
 - b. Conditions at room temperature.
 - c. Conditions at high temperature.
2. Disturbance of this balance at high external temperatures. Heat regulating mechanism laboring under difficulties. Sense of oppressiveness, due to—
 - a. Possible actual rise in body temperature.
 - b. The flushed, heated skin.
 - c. Instinctive lethargy.
3. Absence of movement in air and high humidity—further obstacles in the way of body temperature regulation.

IV. The aerial blanket of the sedentary person.

V. Practical corollaries.

1. Clothing.
2. The value of electric fans.
3. Ventilation—of class rooms—of sleeping and living rooms.

VI. Draughts.

1. Continuous. Gusty.
2. Neurasthenic irregularities.
3. Congestions.
4. Open fireplace.
5. Sudden changes of temperature.
6. Wraps, in and out of doors. Neck mufflers.

VII. Temperature and humidity in relation to the mucous membrane of the respiratory tracts.

VIII. Humidity at low temperatures.

IX. Concluding comment.

A shifting multiplicity of sensations awakens. Dearth or monotony of sensation is soporific. The skin as an extensive sensory organ is in continuous contact with air. The latter if cool and in motion, stimulates the skin and enriches the mind with countless pleasant tactual and temperature sensations. If it is warm and still, just so many sensations are lacking from consciousness; the effect is deadening. This is one way in which close air produces its unpleasant effects.

The temperature of the body is held at constant level by a nicely adjusted mechanism which has already been described—the skin with its varied blood flow and varied rate of perspiration. Maintenance of constant body temperature is most difficult at high and low extremes of air temperature. High air temperature, high humidity, and motionlessness of air often occur when numbers of people occupy a limited enclosed space. Under these conditions, in spite of attempted regulation by the skin,

body temperature may mount slightly and give rise, as a mild but vexatious fever, to the unpleasant symptoms associated with such a situation. Of these symptoms drowsiness may also be the result of deficient blood supply to the brain due to the quantity which must be diverted to the surface of the body.

The skin and mucous membranes are both affected by dryness of the air. There is as yet no united scientific opinion as to what the degree of humidity should be at various air temperatures. At room temperature (68° F) it is said that a relative humidity of 60 percent at least is desirable. Air in heated houses is likely to be too dry.

Draughts should have no terrors for any one of average vigor. However, for the delicate and the sensitively constituted, any plan for becoming inured to them should be entered upon gradually and with extreme caution, if at all.

Sedentary habits and social conventions have made it necessary for civilized people living in temperate climates to cover the larger part of the body. It has been aptly said that, except for head and hands, we live most of the time in an equatorial atmosphere. Loose, porous clothing, frequently changed, will make less torrid and humid the layer of air with which the body is surrounded, and at the same time may be so planned as to give warmth sufficient to the season.

High humidity at low temperatures may sap vitality by drawing off body heat too rapidly. The risk of wet shoes is explained similarly.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 187-210; 442-450.

References: Stiles, *Nutritional Physiology*, pp. 196-203.

Stiles, *Human Physiology*, pp. 364-373.

Fisher and Fisk, *How to Live*, pp. 7-27.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXVII.

Health and Disease.

I. The problem.

Emphasis has repeatedly been laid in the preceding lectures on the need of holding in mind the positive ideal of health, of strengthening and improving the human mechanism by adherence to normal living. However, the very conception of health implies necessarily the danger of disease and weakness. Disease is an undeniable and menacing fact. So while insisting on precedence for clean, wholesome living as an ideal, it were folly to neglect at least mention of the damaging conditions to which the human body is liable, which lessen its usefulness, or prematurely terminate life.

II. The meaning of "health."

1. Objective.
2. Subjective.

Properly arranged conditions of health—Hygiene.

III. The meaning of "disease."

1. Classification of diseases.
2. Preventable and non-preventable diseases.
3. "Fever" and diseases of organic defect.

IV. The occurrence of "fevers."

1. The sudden onslaught on the community—epidemic.
2. Their continuous presence—endemic.
3. The history of the prevention of "fevers."

V. The causes of "fevers."

1. The facts of parasitism among animals.
2. Bacteria.

Disease producing bacteria. Harmless bacteria.

Commercially profitable bacteria.

3. Disease producing bacteria. Whence do they come?
How do they gain entrance to the body?

VI. The Germ Theory of disease. Opposition to this "theory."

VII. What diseases are most destructive?

VIII. Are we more or less susceptible at different ages?

IX. History of the successful warfare on disease.

1. The positive side—health security.
2. The negative side—avoidance of disease.

X. Concluding comment.

The tendency to deterioration marks all living material. During youth it is normally more than offset, and therefore concealed, by the momentum of growth. Later it becomes apparent, gains the upper hand, until finally death results. This process of living decay is normal and inevitable, and in no sense a disease condition. It is however rarely realized. In the great majority of lives it is complicated and hastened by disease. Disease is, broadly speaking, the faulty operation of one or more parts of the living machine. The processes of the machine as a whole then tend to suffer from disorder and inner interference.

Diseases may be subdivided into two types, organic and infectious. Examples of the first type are certain abnormalities of kidneys and of circulatory system and defects of the eye. The origin of many of them is obscure, but is perhaps connected with conditions of civilized life—perverted or incomplete diet, sluggish waste elimination, inadequate physical exertion, chronic fatigue, posture abnormalities. These conditions are a sudden development (of the last three or four thousand years) of man's history. He is as yet ill-adapted to them and has not known how to correct them. Ill-adaptation to environment always means disease and destruction.

Other diseases of this type have their origin in some specific

strain or poisoning—*e.g.*, enlarged heart, phosphorous or alcoholic poisoning. Personal hygiene (knowing how to live “naturally” in the face of complex artificial conditions) should be a bulwark against much organic disease.

Further, organic defect, such as faulty heart structure, may be congenital. Careful attention to personal hygiene has often been known to preserve the defective part and its owner for a life beyond the average in length and above the average in usefulness.

The great group of infectious diseases or “fevers” are, with important exceptions, well known as to origin. Such diseases are caused by the invasion and poisoning of the body by disease-producing microbes (germs, bacteria, micro-organisms). Thus diphtheria is caused by the diphtheria microbe, and tuberculosis, typhoid, pneumonia, cerebro-spinal meningitis, infantile paralysis, each by its specific microbe or submicrobe. Personal hygiene should help, and public and private sanitation (cleanliness and the avoidance of contagion) are helping to lessen the incidence of this class of diseases.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 293–294; 296–303; 463–497.

References: Mackenzie, *Health and Disease*, pp. 23–41, 52–78.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXVIII.

The Conflict with Disease.

I. The problem.

A microbic disease is a battle between the diseased person (the host) and numbers of microbes (the parasites) which gain access to the body fluids of the host. Recovery means the winning of the battle by the host and the defeat of the microbes. Death means that the host has lost the battle; the microbes have triumphed. The fact that in the incidence of a given disease some people recover while others succumb suggests three things: either people differ in the ability of their tissues to counteract microbic poison and destroy the poisoners; or else the microbes which cause the disease differ in poisoning power; or both the vital resistance of the host and the poisoning power of microbes may be variable factors. The last supposition is correct. Study of disease has revealed much of the means by which the body cells and fluids resist disease germs and acquire immunity to disease. The past fifty years has seen amazing progress in methods by which immunity can be artificially induced (safe immunizing against smallpox has of course been practiced since about 1800) and the body defences stiffened on occasion by antitoxic (poison-neutralizing) serums.

II. The conflict between disease producing parasites and the human organism.

Factors in the latter's success.

- a. Offense.
- b. Defense.

III. Measures of offense.

Outside the body—cutting the lines of communication by

- a. Sterilization.
- b. Cleanliness.
- c. Destruction of carrying agents.

IV. Measures of defense. Points of attack.

Inside the body.

- a. The skin and mucous membranes.
Hair follicles. Sweat and sebaceous glands.
Mechanism for removing detritus from respiratory passages.
- b. The parable of the barrel of apple juice.
- c. The prime differences between apple juice and body fluids.
 - (1) What is vital resistance? $\frac{R}{M} = D$.
 - (2) Some possible factors in vital resistance.
The mobile army of the body—leucocytes.
Fortifications—general body cells.

V. Special means of enhancing or aiding the body's defenses.

Immunity.

1. Acquired immunity.
 - a. Naturally acquired. "Minors in the family?
Have you had them?"
 - b. Artificially acquired. *E.g.* vaccination.
2. Aiding the body's defenses. Antitoxin.

VI. Concluding comment.

Certain low forms of life (microbes) have adapted themselves to invade and inhabit for a greater or less time the bodies of higher forms of life, such as human beings. Such invasions could hardly be permitted (even by the most extreme pacifist) since the body would then become a teeming nest of any and all parasites that had the opportunity and the knack of gaining entrance and would soon supinely and miserably perish. So measures of defence have been evolved by which (1) certain tiny cells floating in the blood (phagocytes) mobilize at the first danger signal and attempt to devour the invaders; (2) germ-killing substances are kept in stock in blood and lymph to

discourage possible assailants; (3) special germ-killing substances are formed to repel whatever species of microbe may try to enter; and (4) special poison-neutralizing substances are made by the cells of the body to counteract the poisonous products of the invading microbes. After all these forces and ammunition have been called out in the course of a given siege of disease, the body is in a state of preparedness, as a rule, against that disease for a considerable length of time. The recovered patient is said to be immune to that disease. In some diseases this immunity can be artificially produced, as in small-pox and in typhoid fever. In some, during their course or at their beginning, the defences of the body may be reinforced either by stimulating the phagocytes to redoubled efforts by putting into the blood dead bacteria of the kind that are causing the disease, or by putting therein a poison-neutralizing substance which has been cultivated in the body of another animal, *e.g.*, the well known diphtheria antitoxin.

Undoubtedly "serum treatment" for minor troubles is being and will be carried to excess by the more enthusiastic and radical practitioners of the medical profession, but the legitimacy and common sense of immunizing against such things as small-pox and typhoid fever rest on a statistical basis incontestable among people of education and judgment. So also does the use of antitoxic serums for diphtheria, lockjaw, and cerebro-spinal meningitis, and of "vaccines" for forms of rheumatism, skin infections, etc. No one should permit the alarums of the emotionally minded antivaccination and antivivisection sororities to becloud the plain facts of the value of these proved weapons of science when conservatively and skillfully used.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 497-504.

References: Mackenzie, *Health and Disease*, 52-114.
Health.

Sedgwick, *Sanitary Science and Public Health.*

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LECTURE XXIX

Health and Inheritance.

I. However we may theorize on the causes of life, we can unquestionably perceive one outstanding fact which distinguishes living from non-living processes — the former, barring accident, continue indefinitely. "But whereas life is an endless process as far as we can predict the habitability of the earth, individuals who manifest life have their beginnings and their endings.

As generations follow each other, we note that racial characteristics are very completely and accurately transferred from progenitor to progeny. From a pine seed comes a pine tree—never anything else. From horses are produced horses—never any other kind of animal.

Not only are the characteristics which define the kind of animal or plant thus transmitted with machinelike regularity, but among the higher orders of creatures lesser characteristics—traits and peculiarities conferring "individuality"—are, generally speaking, passed on "from father to son." Wonderful results have been obtained with domestic animals and with plants in "breeding out" undesirable qualities and "breeding in" those qualities that make for strength, speed and beauty, and special shapes, sizes, and colors for special purposes.

In the human animal there are well marked traits that "run in the family." Some of these characteristics, such as potential strength and good stature, integrity, and intelligence are obvious assets to individual or race. Unfortunately there are also many other heritable characteristics which are prejudicial to the welfare of individual and race — tendency toward weakness and subnormal stature, dishonesty, stupidity, laziness.

What is the racial mechanism by means of which generations succeed each other and by means of which traits, good and bad, are transmitted from parents to children? What can be said of

the science of eugenics which aims to show how strong characteristics may be conserved and weak ones weeded out by judicious mating? Can newly developed abilities,—for example musical, mathematical, acrobatic,—be inherited? How does personal hygiene stand with relation to the facts of heredity, in the ideal of invigorating and improving family and racial stock?

II. The living creature as a mind; as a mechanism. Its education and adaptation to conditions.—The role of personal hygiene.

As mind; its birth, growth. Its continuation beyond death—an hypothesis.

As mind *and* mechanism; its individual duration. Its immortality—a fact.

III. The mechanism of immortality—racial continuity.

1. The one-celled animals and plants.

a. Reproduction by cell division—asexual.

Examples—amoeba; bacteria. (See lecture chart No. 1.)

b. Reproduction by fusion of individual cells—sexual.

Example—Paramoecium. (See lecture chart No. 2.)

2. Make over, in fancy, the life history of the Paramoecium.

a. Imagine all but one of the daughter cells formed from the union of two of these one-celled animals *combining* to form an *organism* surrounding the remaining one. (See lecture chart No. 3.)

b. Suppose the former to give up their right to indefinite cell division and life—become mortal; the latter to be responsible for continuing the race.

c. Then there would follow the necessity not merely for two cells but for two complex individuals to co-operate for race continuity.

(Note. Bear in mind that this is a purely imaginary transformation.)

- d. This fancied change in the life history of a one-celled animal may be used as transition to——

IV. The higher animals and plants.

1. Body cells composing the visible mechanism which grows, lives, and dies.
2. Germ cells harbored within the body. A new creature may be formed by the fusion of a germ cell of one individual with that of another. (See lecture chart No. 4.)
3. Division of function between the two types of germ cells—male and female.

V. Health and sex.

1. The lower animals. No knowledge. Therefore no ignorance with attendant evils. Continuation of the race automatic.
2. Man. Power of thought. Knowledge and therefore ignorance, superstition, misconception, and flippancy.
 - a. Social conventions, the negative instrument for combating ignorance.
 - b. The positive instrument—well balanced, wholesome estimate of family life. The combination of frankness and reserve.
 - (1) The fundamental meaning of the sex difference for the progress of the race.
 - (2) The highest qualities of character, chivalry, forbearance, devotion, resulting from the mutual reaction of masculine on feminine mind.

VI. The meaning of inheritance. The individual's combined racial, national, and personal birthright.

1. The mechanism of inheritance.

The continuous line of germ cells from and around which the body is at once an offshoot and an envelope.

Traits, capacities, limitations carried in some way in the material of the germ cell; they characterize the individual developing therefrom.

2. New accomplishments of body and mind do not add themselves to the heritable traits stored in the germ cells. Apparent exceptions in the general weakening effects of alcohol and ill health.
3. Responsibilities for right living and high endeavor not therefore lessened.
4. The eugenic ideal. A subject in its very beginning. Danger of glib and sophomoric conclusions.

VII. Concluding comment.

What we are, or rather the limitations on what we can become and on what we can do are given us as a sealed, combined legacy from our two parents. But they did not originate, they but passed on some of the elements of personality, the capacities and limitations which made them what they were. These elements they received, each from his two parents. We also will hand on to the next generation some of the characteristics which have been contributed to us by our forebears.

These characteristics or elements of personality, passed from parent to child, are the heirlooms of the human family, and like literal heirlooms they are, fortunately, not affected by the manner of life of their custodians. They are handed on unaltered, except as they may be lost, latent, or combined with other elements of personality in mating. In other words, no accomplishments of ours, no extreme development (or neglect) of posture, of linguistic, mathematical, artistic aptitude, or what not, can add itself as a new element of personality to the heritage which our children will receive from us.

Does this, the present scientific view, reduce to futility all personal effort toward advancement and improvement? It does not. It leaves us with responsibilities sufficiently heavy,

obligatory, and exciting—responsibilities of discovering what we have in our “prize package” of inherited qualities, of developing the favorable ones and repressing the unfavorable ones in such a way that personality may reach its best possible usefulness and serve as an invaluable model for the children who will later begin to investigate their “prize package.”

The science of eugenics has progressed scarcely far enough to be formally introduced into an elementary discussion. The problem of weeding out imbecility, crime tendencies (if they exist), and heritable disease by legal prevention of marriage among the obviously unfit and corrupt, is comparatively simple. But that of cataloging, standardizing, and recommending the best combinations of positive virtues, without at the same time sacrificing the very highest human qualities, such as personal initiative, devotion, self-denial, and affection—this part of the problem shows little prospect of practical solution.

Personal hygiene strongly supplements the practical knowledge of heredity. Degeneracy and acquired disease are not heritable in any true sense, though the latter may be transmitted to unborn children just as it may be transmitted from one adult to another by contact. The consequences, in weakened and handicapped children, may be serious enough. Acquired health or acquired good posture are no more heritable than any other acquired characteristic. But they make easier the complete realization of the parent's inherited possibilities and provide (especially in the case of the mother) the children with a strong start which, supplemented by intelligent care, help them to pass successfully through the dangerous periods of infancy and early childhood.

Assigned reading: Fisher and Fisk, *How to Live*, pp. 163-168, 293-324.

Reference: Jordan, *The Heredity of Richard Roe*.

The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

LECTURE XXX.

Public Health.

I. The problem.

The health of the individual like "individual liberty" has a new significance when people live in communities, their food and water from immense common sources, their individual and household wastes disposed of *en mass*, their work and recreation regulated by commercial custom and by special laws, their individual length of life and causes of death recorded, tabulated, and summarized, and when modern transportation literally brings the people of the whole world *into touch* with each other. When people come into direct contact or use utensils or food that have recently been touched by others, the chances of the spread of infectious disease are fearfully multiplied. Transportation extends to the end of the earth the possibilities of miscellaneous contact and therefore the possibilities of the transmission of disease. Thus not only may infectious disease sweep through a limited area as an epidemic due, for instance, to contamination of milk or water supply, and not only may it smoulder over long periods of time in a given locality, transmitted from person to person by touch, but it may leap a state, or a continent, or an ocean—milk from New Hampshire carrying septic sore throat to hundreds of Boston people, hides from abroad and from the West bringing anthrax to eastern cities, plague from the Orient flaring out in San Francisco, cholera from overseas prostrating an inland city of Germany.

The answer to the increasingly difficult problem of handling health and disease in the bulk has been the evolution of the science of *Sanitation* and *Preventive Medicine*.

II. Dealing with the health of the individual—with health in the aggregate. The reality of public health.

III. Community life. The health situation compared with that of the individual.

1. Foods and drink from common sources.
 - a. Water supply. The possible dangers. Safe-guards. Foreign travel.
 - b. Milk supply.
 - c. Food. Purity. Inspection. Restaurant service.
 - d. Special foods. Oysters.
2. Interchange among population.
3. Housing. Parks and playgrounds. Gymnasias. Baths. Streets. Dust and soot.
4. Disposal of sewage and refuse.
5. Hygienic education and propaganda.
6. Recognition and isolation of infectious disease.
7. Immunizing against infectious disease.

IV. The college as a parcel of public health.

The problems here offered.

- a. Wholesome food and airy lodging.
- b. Safe milk and water supply.
- c. Decent disposal of waste.
- d. Prevention of possible infection. (Common cups and towels).
- e. Isolating infectious cases.
- f. Providing opportunity for exercise and other hygienic diversion.

V. Concluding comment.

In contemplating the vast magnitude of the problems of state, national, and world sanitation, one must not forget that without individual co-operation in *personal hygiene* and *private sanitation* they can be but very imperfectly solved. Both personal hygiene and private sanitation (attention to household ventilation, to scientific cleanliness of food, to the choice and protection of water supply and to the safe disposal of sewage in

the case of country dwellings, to decent avoidance of possible contagion, direct and through towels, drinking glasses, etc.) must reinforce *public sanitation*, strengthening its work in the community by intelligent and exemplary concurrence in the regulations and recommendations of the health authorities.

The necessity for such co-operation has not been fully appreciated until the last few years. Even without it, the incidence of infectious disease has been marvelously lessened in civilized countries by scientific research and by the police supervision on the part of governmental health officers. But the non-infectious diseases such as degeneration of circulatory system or kidneys, having their origin in no special causative agents as far as is known, but in faulty habits of living probably, have hitherto escaped statistical attention. Now it is found that they are on the increase in this country. Boards of health can not reach these diseases by the old methods used in expunging small-pox, typhus, typhoid fever, etc. They can be reached only with the help of personal, intelligent health conservation.

Assigned reading: Hough and Sedgwick, *The Human Mechanism*, pp. 505-540.

References: Mackenzie, *Health and Disease*, pp. 155-169, 180-214, 231-252.

Sedgwick, *Sanitary Science and Public Health*.

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The space below is reserved for the written assignment. Do not use it for lecture notes. Write briefly, coherently, and legibly.

REFERENCES.

Personal Hygiene cannot fail to have a stronger meaning when it is demonstrably linked with personal success, national progress and the larger values in life. Therefore the following list of books has been expanded a little way into the fields of general biology and the science of human progress.

The books marked with an asterisk are suitable for use by the students who take this course. The others are included for the convenience of the instructor or advanced student.

The arrangement of titles under each general heading is in accordance with the subheadings of the lecture outlines, and roughly in the order of the books' importance as lecture supplements in this course.

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*Lee, *Physical Exercise from the Standpoint of Physiology*, Amer. Phys. Ed. Rev., XIV, 4, Apr., 1909.

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*Stiles, *The Nervous System and Its Conservation*, Saunders, 1914.

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